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PUBLIC WORKS

CITY COUNTY STATE

THE "EVANSTON PLAN" OF STREET MAINTENANCE

WITH natural pride in their beautiful city, which lies just north of Chicago, the property owners and city authorities of Evanston, Ill., have worked out what has come to be known as the "Evanston Plan" for keeping their macadam streets in first-class condition.

The property owners on many streets have local Improvement Associations, who voluntarily contribute to the cost of maintenance of their street. This fund was formerly used for street sprinkling, but is now being used in systematic Tarvia maintenance.

The work is handled by the street department under the direction of the Commissioner of Streets. This has worked out so satisfactorily that some of the Associations have a surplus in their treasury, where formerly all the funds went into street sprinkling, and the streets are dustproof, waterproof and automobile proof.

Keeping Ahead of Old General Neglect

The policy of the City of Evanston is to repair and re-treat the streets *before it is absolutely necessary*. Three patrol gangs are kept on the streets all summer, immediately patching any spot in the macadam that begins to show signs of wear. As a result, the entire system of more than a half million square yards of Tarvia-treated macadam pavement is kept in wonderful condition all the year round.

Orrington Ave., Evanston, Ill., Old waterbound macadam re-surfaced with "Tarvia-A" June, 1919

In fact, the streets of Evanston form a striking testimonial to the efficiency of systematic Tarvia treatment and low cost maintenance.

The Efficiency of Barrett Service

The present Commissioner of Streets, Mr. R. M. Brown, writes as follows:

"Efficiency of service by your company in the delivery and application of Tarvia to the City of Evanston during the past season has been very satisfactory.

I assure you that your efforts in our behalf are appreciated, as we are able to keep our pavements in good serviceable condition despite the fact that they are subjected to unusually heavy traffic."

Property Owners Prefer Tarvia

Former Commissioner of Streets, Mr. Walter W. Krafts, before leaving office, wrote as follows:

"The people of Evanston are satisfied in every respect, and in asking for work to be done on streets, are asking for Tarvia in preference to other binders."

The Evanston plan of street maintenance is attracting a great deal of attention in other municipalities.

We should be very glad to explain this plan in greater detail to any interested city official or property owner upon request. In writing, address the nearest Barrett Company office.

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

Tarvia

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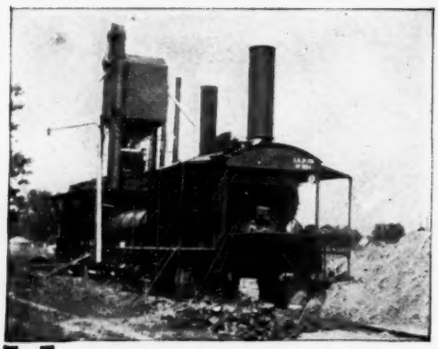
THE BARRETT COMPANY, Limited: Montreal, Toronto, Winnipeg, Vancouver, St. John, N. B., Halifax, N. S.



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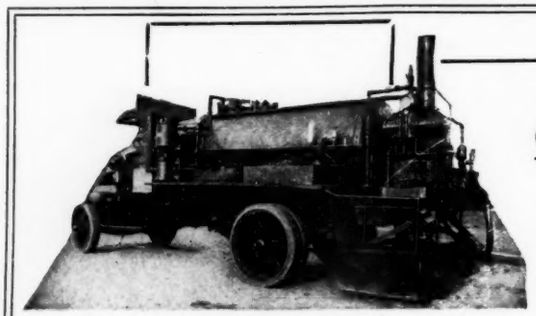

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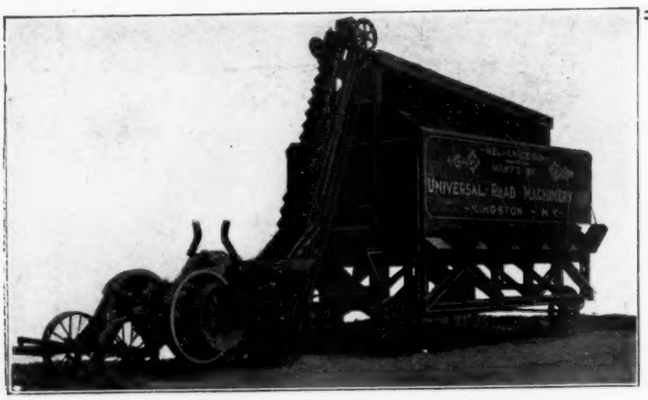

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PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"

Entered as Second-Class matter at the Post Office at Floral Park, N. Y., August 27, 1920, under the Act of March 3, 1879.

Vol. 50 FLORAL PARK, JANUARY 15, 1921 No. 3

Difficult Swamp Road Construction

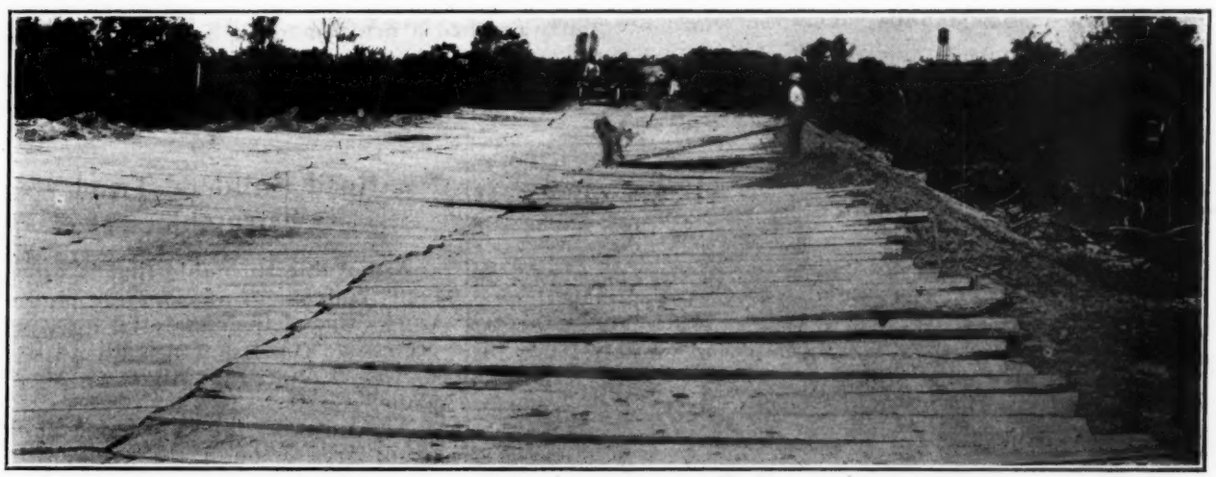
Wide sand embankment sunk to hard bottom 35 feet deep. Fresh fill settled 8 feet overnight. Original surface upheaved 8 feet. Hard bottom brought to top alongside embankment.

Contract 18 of the State Highway Department of Delaware, for a section of standard concrete roadway, was awarded to the Piel Construction Company, Baltimore, which executed the work under the direction of Charles M. Upham, chief engineer. A portion of the road, which was built under a sub-contract awarded to Sherman & Rhoades, is located for about 700 feet through a swamp which, it was indicated by preliminary soundings, consisted of mud and peat to hard bottom at a depth of about 35 feet.

Over this soft ground, concrete pavement will be constructed on an embankment 36 feet wide on top, with sides sloping at the natural angle. The top of the embankment is about 6 feet above the original surface of this swamp and the embankment contains 57,000 yards of sand from a borrow pit about 2,000 feet distant.

Work on the swamp was commenced about June 15 and was completed in October. The whole 700 feet of the embankment has apparently reached a stable condition, although settlements, very deep and rapid at first, continued with decreasing amounts for many weeks after the deposition of fill was commenced at any point. Estimates made from the original cross sections indicated that about 18,450 yards of fill would be required, and it was contracted for at the unit price of $1 per yard, measured at the borrow pit, a reasonable figure which, for the originally estimated quantity, would have yielded only a narrow margin of profit.

Sand was excavated in the borrow pit by a Bucyrus steam shovel with ¾-yard dipper working on a vertical face about 14 feet high and delivering to 1-yard steel boxes balanced on supports built up on eight Ford trucks. The trucks, under the personal supervision of one of the contractors, made a round trip from shovel to embankment and return in an average of 8 minutes. A corduroy road made of transverse planks was laid on top of each lift of the embankment as fast as the latter was built, and the trucks passing over it, turned around at the end of the lift,



PLANK ROADWAY FOR DELIVERING FILL IN SWAMP. SETTLEMENT AFTER 30-FOOT EMBANKMENT HAS BEEN MADE

backed close to the edge, and were dumped by hand.

The embankment was built with nine successive lifts or layers from 5 to 10 feet thick, the sides of which sloped about 1 to 1 at the top of the embankment where it is exposed above the surface of the swamp. As fast as one lift was completed, the loose planks were stripped from it and placed on top of the succeeding lift, which sometimes could hardly be made as fast as the settlement progressed after it was started. Usually the thick mat of grass and roots and top crust of the swamp sufficed to sustain the first lift of the embankment with only a few inches of slow uniform settlement, not enough to break through the crust. After the first lift had been made for a length of about 100 feet the second lift, of about 6 feet, was made like the first one, commencing at the south side of the swamp and working north, and soon afterwards rapid and irregular settlement commenced breaking through the crust, and allowing the fill to displace the soft, wet material below it.

ONE LIFT PLACED AND SETTLED IN SWAMP, AND SECOND LIFT BEING PLACED

The sand penetrated through the turf and mud to final bearing on the hard clay bottom of the swamp basin. The extensive transverse displacement of the plastic soil caused horizontal and vertical movements in it that produced upheavals of from 4 to 8 feet above the original surface, for distances averaging from 30 to 60 feet beyond the embankment.

The irregular surface of the upheaval was of a rolling character, with the grass and vegetation at first little disturbed but finally often breaking in long cracks through which mud and clay often extended. The appearance of this clay, spouted up through these openings, is interpreted to indicate that the fill has reached hard bottom and that a little of it has adhered to the layer of soft materials displaced. Soon after this occurred the settlement ceased and the embankment apparently attained final stability.

Sometimes a considerable length of the apparently completed embankment would settle 6 feet in 24 hours. The settlement was very irregular in location, character and rapidity, sometimes commencing in the center, sometimes on one side, and then on the other side, or sometimes uniformly, or on either side alone. In one case a settlement, greater on one side than on the other, was so rapid that the planks remaining on top were displaced to an inclination of 20 degrees from the horizontal.

Sometimes settlement occurred on the middle line without much occuring on the sides, thus producing a V-shaped trough 60 to 70 feet long and 9 to 10 feet deep, with a regular cross section that continued to settle so that an 11-foot lift only raised the surface 2 feet. In another place 8,000 yards of sand were required in two weeks for fill on a settled section less than 100 feet long.

Care was taken to have enough trucks in service to keep the steam shovel working almost continuously at the rate of about 500 yards per day. The rough, soft road, steep grade, and rapid work proved severe for the trucks and required the constant services of one man in the repair shop to keep them in order. The most serious trouble was the stripping of the reverse gears, caused by backing up steep grades. Provisions were made for this so that the gears could be replaced overnight.

This fill has been completed and has apparently reached a firm foundation. Levels will be taken during the winter and spring to determine the settlement that takes place during the winter season.

SHOVEL IN BORROW PIT LOADING 1-TON TRUCK WITH 2 DIPPER FULLS

Road Builders' Truck Turntable

A portable turntable that is especially convenient for handling motor trucks that deliver material for concrete road construction is illustrated in the "Concreting Highway Magazine."

The turntable has a wooden platform large enough to receive the wheel base of the largest trucks served, that is mounted on wheels running on a circular track rail and

pivoted to the frame by a vertical steel center pin. The track is made in three hinged sections so that the two segments projecting beyond the platform can be folded up and the inclined platforms connected to each end of the revolving platform are hinged to it and can also be folded up, making the whole construction very compact for easy transportation. The turntable was used by Charles Spindler, contractor for 4 miles of concrete road in Alabama.

Water Works Notes in Europe

Interesting details of the Liverpool and Sheffild water works. Sewage used as compensation water for factory use.

In a trip made in 1919 by Thorndike Saville, some interesting features concerning English water works were observed and recorded in his notes of the trip.

The Liverpool water supply is obtained from two main sources, one at Rivington, the other at Vyrnwy, 77 miles from the city. Owing to inaccurate rain-fall data on which the estimates were based, the Rivington source has contributed only ⅝ of the estimated yield. At Lake Vyrnwy the water is filtered and is then strained through 60-mesh screens at the Prescott distributing reservoirs about 7 miles from the city, but in spite of this screening there has been trouble from deposits of clodothrix in the mains from the impounding reservoirs and in some of the city mains.

In one of the reservoirs at Prescott there is a pendulum valve on the outlet to the distribution mains, which is so devised that, in case of a break in the mains, the increased velocity of water through the pipe moves the pendulum, a ratchet on top of the pendulum is released and the emergency valve gate drops, cutting off the flow of water.

There is no standard of color used generally in England, such as the platinum-cobalt standard of the United States, and the color of the Liverpool water is stated as being 4.6 measured by a standard devised by the brewers for comparing colors of beer.

A unique proposition was being considered for securing additional water supply for the city of Sheffield. The matter was then being heard before the committee of the House of Lords, which was taking the evidence of many of the most noted sanitary engineers and chemists of England. The proposition involved the return of sewage, after it had been treated by the activated sludge process, to a compensation reservoir above the city, where it would be diluted with river water and used for factory and mill water supply. The water supply of Sheffield is limited and a series of three dry years would produce a water famine. It was necessary, however, to take water from the river Don or to spend 15 years in constructing works to obtain it from Scotland. After being diluted with river water, it was proposed to take 5 million gallons per day of the mixture, soften it by use of $NaCO_3$; sterilize (possibly) and pump to a balancing tank, from which it would be distributed to industrial plants along the river. The scheme was objected to by the Local Government Board on the score of sanitation, depending on the efficacy of the activated sludge treatment; if this is as good as the experiments, the board would be satisfied. The mill owners objected that the reaction of the $NaCO_3$ with iron salts from the steel works would probably produce a scale-forming ingredient in the water. On the other hand the city claimed that the river water would be improved from a chemical standpoint and the mills would be relieved of part at least of the cost of softening which they now are burdened with, as it could be done more cheaply at the central plant of 5 million gallons capacity.

In France Mr. Saville noticed a much more general use of concrete for water tanks than in the United States, and they seemed to be tight and dry as well as artistic.

Flood Control by Small Dams

Suggests inexpensive retention dams, similar to those of the Miami Conservancy District, but on a smaller scale, on the various tributaries.

In an address before the Tenth Annual Drainage Convention at Washington, N. C., Thorndike Saville, associate professor of hydraulic and sanitary engineering in the University of North Carolina, suggested consideration of methods of controlling or reducing the peak flow of floods in order to prevent damage done by such floods, reference being made to erosion of drainage ditches as being of special interest to those before whom the address was given.

"The problem is to so regulate the discharge of flood water to a stream that it will rise only a predetermined amount beyond its normal level. For this purpose it is necessary to study the catchment basins of the tributary streams.

"It is necessary to know their rate of flow in flood, the time interval which their flood crest takes to reach the main stream, and the effect of the various tributary floods on the flood crest in the main stream. It is when the flood crests from a considerable number of tributary streams reach the main stream at nearly the same time that great floods result. Often by straightening and widening channels the delivery of flood waters from some tributaries may be hastened and the flood in the main stream reduced in magnitude.

Since the total amount of water to be delivered is not greatly affected by such measures, the duration of flood in the main stream will be extended, though its magnitude is decreased.

"When the measures noted in the preceding paragraph are ineffective or impossible to achieve it becomes necessary to construct retention reservoirs. By this is not meant necessarily the creation of large impounding reservoirs by high dams. It is frequently possible on small streams to erect low dams on the tributaries, such that the flood waters may simply be retarded to a sufficient degree to prevent simultaneous discharge of flood crests to the main stream. In many instances in drainage projects it is possible to place one or more such barriers on the main stream itself. The construction of such retention basins is probably best effected by a somewhat similar procedure as is being applied on a large scale in the Miami Conservancy District near Dayton, Ohio. This method consists in constructing retarding basins at selected points on the tributaries and main stream. In the case of drainage districts served by a 'flashy' stream, a low dam may be located at an appropriate place with a culvert opening in it. During normal flow the culvert discharges the waters of the stream as if no dam were there. During flood flow the discharge of the stream increases beyond that for which the culvert is designed and water is impounded behind the dam. The culverts then discharge under a hydrostatic head and are so designed that they will deliver water at such a rate as to keep the height in the main stream below a predetermined level. As the flood flow decreases the culverts continue to discharge until the impounding basins are empty. Such a scheme may be quite inexpensive as compared to elaborate construction of levees and increased size in ditches and canals to take the flood flow.

"The suggestions in the preceding paragraph relate primarily to the construction of low, inexpensive dams to create retarding basins. A similar control of floods may be obtained by the construction of higher dams creating large storage reservoirs. Here the reservoir may serve the double purpose of flood regulation and power development. Such structures are relatively expensive and are economical only under conditions of good dam site, fairly large normal flow of the stream, and a market for the power. There are doubtless some situations in North Carolina, particularly in the Piedmont District, where such developments would be profitable. The utilization of our smaller water powers is becoming increasingly important, especially in the cheap production of electric power for promoting conditions in the rural districts equal in convenience and comfort to those in the city. The co-ordination of water power developments and flood regulation in drainage districts is one of the more practical means of meeting this problem."

Treating Sewage by the Dorr System

Sedimentation secured by radial surface flow, and continuous removal of sludge revolving plows. Description of the Mt. Vernon plant, containing a special type of screen and of activated sludge apparatus, which gave unusual efficiency of the air used.

A few weeks ago a paper was read before the Boston Society of Civil Engineers by R. H. Eagles describing apparatus devised and marketed by the Dorr Co. for securing the sedimentation of sewage and trade wastes and removing the sludge from the same, which paper was discussed by Edward Wright, assistant engineer of the Massachusetts State Department of Health, Harrison P. Eddy of Metcalf & Eddy, engineers of Boston, and by Robert Spurr Weston of Weston & Sampson, also a Boston engineering firm; all of whom are well known in the field of sanitary engineering.

Mr. Eagles opened his paper with a discussion of certain features of the theory of sedimentation which forms the basis of the Dorr methods and apparatus; which theory is given below, somewhat condensed.

"Generally speaking, the basic factor in causing solid particles to settle from a flowing liquid is decrease in current velocity to secure the maximum attractive effect of gravity upon the particles. This effect would normally be expected to result from the expansion of the cross-sectional area of the flow into any shape of basin.

"The assumption is doubtless the basis of the general practice of figuring sedimentation basin capacity to give arbitrary volume detention in hours. In our opinion, this basis is not entirely correct as it assumes that the time required to fill a basin under a certain flow will be the period of detention, whereas in actual practice this would mean perfect distribution of flow across the entire cross-sectional area of the basin. This condition is next to impossible and difficult to even approach.

"The use of over-and-under baffles in single-story settling basins has been frequently used to approach this ideal distribution of feed, but it would appear that the constriction in cross-sectional area of flow at each baffle is defeating the original purpose of the basin by increasing current velocity at those points."

The Dorr Co., in its apparatus, relies upon the

method of expanding the surface area of flow to a maximum, securing uniform surface distribution by radial flow from the center of a cylindrical tank to uniform flow over a peripheral weir. This reduces the question of settling basin capacity to that of allowing an area of surface sufficient to reduce the depth of the zone of surface flow to a minimum, so that settling particles will have a minimum distance to fall before escaping the influence of the flow zone. The factors are apparently the velocity of vertical motion of the settling particles, the depth of the liquid flowing from inlet to overflow weir, the velocity of such flow, and the percentage of settleable solids which it is desired to remove.

The rate of subsidence of two feet per hour would give a settling capacity per square foot of surface of 15 gallons per hour, and a tank 100 feet in diameter with a 2-foot rate of subsidence would provide a settling area sufficient for a flow of about 2½ million gallons a day.

There are, in addition, a number of factors which must be considered in estimating and planning such apparatus, these including velocity of surface flow, velocity over weir, variation in quantity of flow, variation in chemical and physical character of sewage, and variation in temperature. It is assumed that no sludge will be allowed to remain in the tank sufficiently long to begin putrefaction or the creation of gases which, in rising, would interfere with sedimentation. If the basins are not cleaned continuously or at frequent intervals, some depth must be allowed for the storage of sludge, but with the Dorr apparatus there is continuous removal of the deposit and, theoretically, one foot depth is as good as six so far as the clarity of the effluent is concerned.

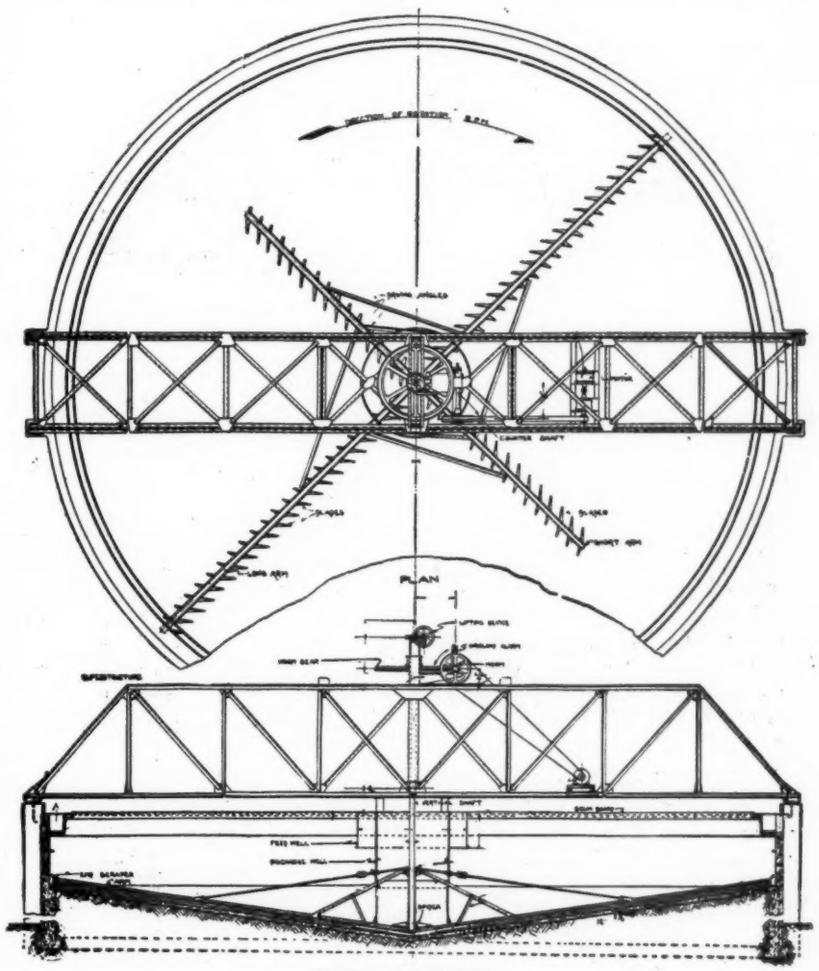
It is claimed that this clarifier secures the following conditions: The even distribution of flow from feed to overflow weir; maximum length of overflow weir consistent with practical design; true level and alignment of overflow weir; absence of obstruction (such as baffles) which will create eddies and stray currents; protection in certain cases against formation of wind riffles; elimination of gas channels; and continuous removal of settling solids in such a manner as not to create any interfering currents.

"The question of overflow velocity at weir is an extremely important one. Upward currents are created which tend to lift the lighter solids and carry them over. Light solids which have settled to a depth of 12 inches by the time the outer limits of a tank are reached are sometimes caught in the zone of this upward current and removed in the effluent, thereby defeating the process of sedimentation for such particles.

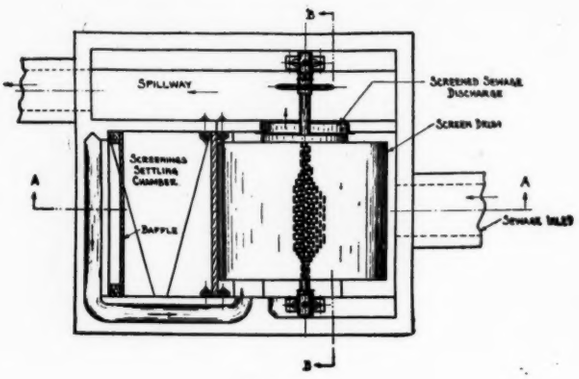
"The depth at which these effects are noticeable is directly dependent upon the weir velocity, and by securing the maximum length of weir consistent with uniform distribution, the conditions will be best cared for."

In discussing this matter of sedimentation, Mr. Weston cited, as an illustration of the fact that a shallow tank for sedimentation is no new idea, a paper by Allen Hazen entitled "On Sedimentation" in volume 53 of the transactions of the American Society of Civil Engineers, in which Mr. Hazen discussed the efficiency of an assumed basin in which the water passing through it flows in a thin layer while the water below it remains quiet or nearly so.

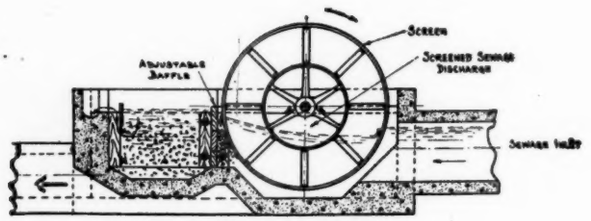
Continuing with the discussion of clarification, Mr. Eagles stated that where the very finest solids and colloidal matter must be removed, floc-



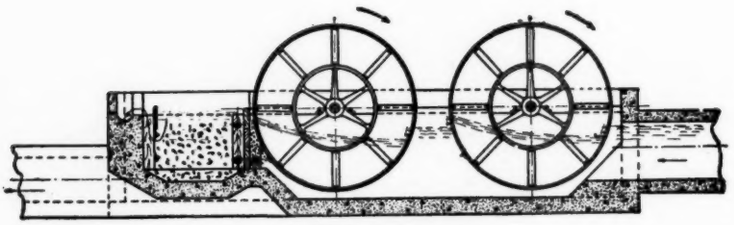
THE DORR SEWAGE CLARIFIER.



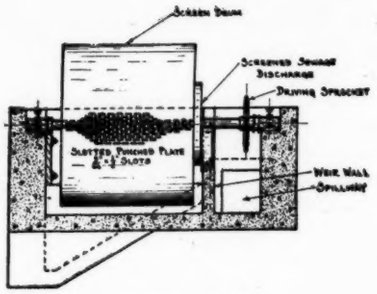
PLAN VIEW



SECTION ON A-A



PARALLEL ARRANGEMENT
THE DORRCO SCREEN



SECTION ON B-B

culation must be resorted to, an agglomeration of fine particles into readily settleable floccules being brought about by the introduction of certain electrolytes or coagulants. The formation of floccules may be rapid and complete or slow and incomplete. The rate of settling increases with the growth of the floccules and the maximum rate may not occur until after 30 minutes or more. The detention of the liquid dosed with coagulant to take advantage of the maximum settling rate is obtained by submerging the feed well the distance necessary for volume detention, with due regard to proper distribution and elimination of short circuits.

The essential feature of the Dorr clarifier is a slowly rotating mechanism consisting of radial arms carrying plows which mechanically collect all the solids which have settled and reached a condition suitable for removal. The solids collected by the slowly revolving plows are piled up around the outside of the central sludge well and form a sludge seal around its bottom opening, so that only the thickened sludge can find its way into the well when the sludge pump is operating. A thickening action takes place by reason of the compacting effect of the plows, which tend to press the sludge particles together in moving them to the center. At the same time the plows open up channels in the sludge bed to allow the water which is squeezed out to escape. The sludge leaves the basin with a consistency considerably denser than would be obtained by the action of gravity alone in a shallow basin.

One plant was referred to where a clarifier 32 feet in diameter was handling an average of 600,000 gallons a day and removing 95 per cent of settleable solids and producing a sludge that has analyzed as low as 67½ per cent moisture and recently averaged 70 per cent; the sewage treated being domestic combined with gas house and straw board factory wastes. A cone-bottom type of settling basin with a 97 degree bottom slope (Dortmund type) produces a sludge of 93½ per cent moisture content, operating under identical conditions and twice as deep as the clarifier.

The process and device was first used for treating trade wastes, such as waste water from tanneries, glue and gelatine manufacturing processes, packing houses, textile mills and manufacturers of milk products, dye stuffs, etc. In most cases such treatment plants are installed because they are required by the state health authorities, and manufacturers adopt devices which save labor as much as possible and insure uniform results without technical supervision.

MODIFICATION OF ACTIVATED SLUDGE PROCESS

Early in 1919 the city authorities of Mt. Vernon permitted the Dorr Co. to establish at their sewage treatment plant an experimental station where about 45,000 gallons per day of fresh sewage was passed through a tank devised by C. Lee Peck, director of research and development of the sanitary engineering department of the company, for utilizing the activated sludge process. Mr. Peck's idea was to evolve an apparatus that would

secure a high efficiency from the air in order to reduce operating costs to a figure comparable to that obtained by other systems in general use.

"It was observed that a considerable portion of the air which was diffused into the open type of aeration chamber was inefficiently used to keep the body of sewage in agitation, the object being to produce prolonged contact between air bubbles, activated sludge flocs, and fresh sewage. It appeared as though the agitating effect of the air could be mechanically improved, as many of the bubbles escaping from the open type aerator pursue a straight-line course from the diffusing tile to the surface, without having done appreciable work, either chemical or mechanical.

"This inefficiency is shown by the fact that the normal oxygen consuming value of the activated sludge mixture is approximately .05 cubic feet per gallon, while ordinary practice has shown an actual requirement of 1½ cubic feet or more—30 times the theoretical. A further apparent drawback to the system is the necessity of re-activating a portion of the withdrawn sludge and returning it to the fresh sewage feed in order to continue the biological cultivation necessary for satisfactory aerobic digestion of the impurities.

"The idea was conceived that an aeration unit could be designed to effect self-contained sludge circulation and prolonged contact by utilizing the full mechanical efficiency of the escaping air bubbles in the form of an air lift."

Other features were developed which warranted the adoption of a distinct name for the modified process, which has been designated the "Dorr-Peck" process.

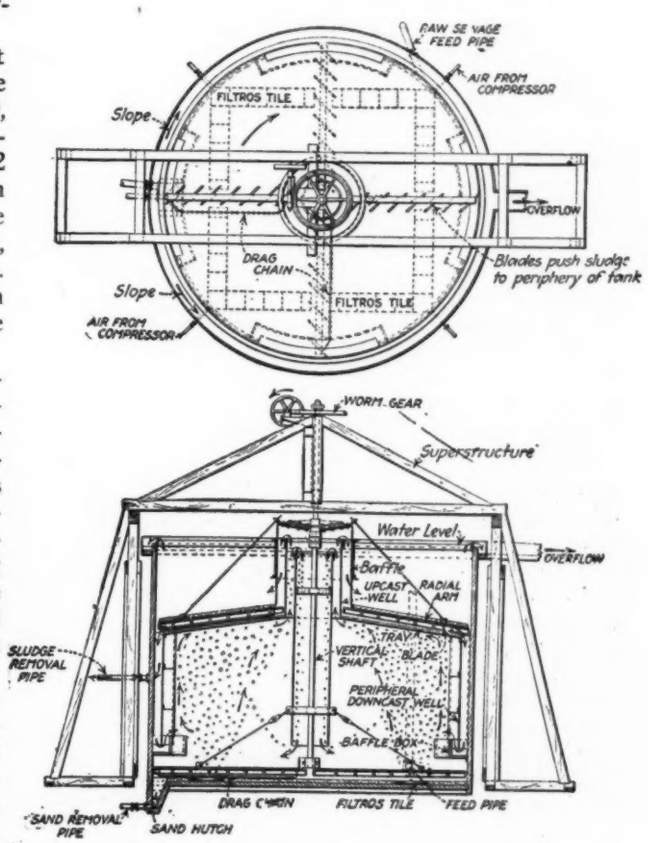
In the experimental plant the sewage first passed through a Dorrco screen of the drum type which was described in the September 27, 1919, issue of "Municipal Journal." The average removal of suspended solids by this screen was 12.2 per cent. The action of the screen resulted in breaking up most of the soft solids, which were easily digested in the subsequent activating units, this not including tough and non-digestible solids. This permitted the nitrogenous matter to pass on to the activating tank and excluded from it the non-nitrogenous matter.

The screened sewage passed to two aeration-sedimentation units operating in series and constructed as shown in the illustration. The sewage was delivered at the top of the central down-cast well and was instantly mixed with 20 times its volume of freshly activated mixture containing a high concentration of activated sludge solids which were brought up from the aerating chamber and delivered at the surface from the throat of the air lift formed by the constricted annular well surrounding the central down-cast well.

The cycle consists of a rapid elevation of the activated mixture from the aerating chamber to the surface, receiving the small proportion of fresh sewage, and a quick passage down again by way of the central down-cast well. This action tends to rapid aerobic digestion by actual dilution with the effective medium. There is a continuous displacement from the circuit of a volume equal to the fresh feed, and this is pushed over into the outside annular well, which acts as a feed baffle and distributor. Thence it flows to the quiescent sedimentation chamber in the upper portion of the tank. The effluent overflows around the periphery of this chamber, the solids settling to the tray bottom where they are mechanically pushed to the peripheral down-cast wells, dropping through to the aeration chamber and entering the circuit again. A small portion of the fresh sewage accompanies the feed to the sedimentation chamber without having passed around the circuit for proper aerobic treatment and for this reason the effluent is passed through a duplicate unit where the cycle is identical with that of the first unit except that 75 per cent of the oxidation or activation having been effected in the first unit, a correspondingly reduced amount of air is supplied to the second unit.

In order to secure a supply of biologic sludge in the second unit to complete the purification, no sludge is withdrawn from the first unit, but it is allowed to build up in the sedimentation chamber and overflow with the partly purified liquor. The only point of sludge withdrawal is from the tray bottom of the second sedimentation chamber, where it is withdrawn as required to keep it from building up and overflowing with the finally purified effluent.

"The average air requirement was 0.6 cubic feet per gallon of sewage treated, maintained uni-



THE DORR-PECKACTIVE AT DSLUDGE TANK

formly over a period of two months. The detention period through the system ranged from eight to ten hours. A clear, colorless effluent was produced, containing less than 20 p. p. m. of suspended solids, up to 1 p. p. m. of nitrate and nitrite nitrogen, and was stable at least six days to the methylene blue reaction at room temperature. A 90 per cent removal of bacteria was effected, and the oxygen-consuming power was reduced 80 per cent. The sludge contained 7 to 9 per cent of nitrogen, on dry basis, expressed as ammonia.

"The sewage treated was fresh domestic sewage of the following average composition:

Total solids, 596 parts per million.
Suspended solids, 245 parts per million.
Dissolved solids, 351 parts per million.
Alkalinity, 265 parts per million.
Oxygen-consuming power, 154 parts per million.

"The average flow treated was 45,000 gallons per day. The two aeration-sedimentation units consisted of cylindrical wood tanks, each 12 feet in diameter by 11 feet deep, combined capacity 17,600 gallons. Each tank was equipped with a Dorr tray thickener mechanism, the lower arms being equipped with squeegees to move any heavy grit to a peripheral sand hutch, for removal as required. The upper set of arms swept the surface of the tray bottom of the sedimentation compartment, moving the sludge to the peripheral downcast wells for re-circulation, and preventing accumulations of septic masses. In the case of the second unit, the squeezing effect of the plows tended to de-water the sludge to ultimate density for final withdrawal. The thickest sludge removed, however, contained 98.5 per cent moisture, due chiefly to the small size of the unit which transmitted slight disturbances, interfering with the normal de-watering operation.

"The air was supplied by a Nash hydroturbine compressor, and was measured by the Rotary Meter Company's compensating meter, which is so designed as to compensate for any air pressure applied, registering only the actual amount of free air passed. The meter was frequently checked by mercury manometer readings through an orifice, and found accurate. The sewage flow through the plant was recorded over a 90 degree V-notch weir, by a Foxboro recording depth gage.

"Filtros tile (Grade E) was used as a diffusing medium, with satisfactory results. No measurable building-up of pressure through clogging was registered during the five months' period of operation. Furthermore, the air supplied by the Nash compressor is quite free from dust, due to a water-washing action which is a part of its operation.

"The results are gratifying, and indicate a marked advance in the treatment of sewage by aerobic methods. It is realized that they are not conclusive, by reason of the fact that the local conditions at Mt. Vernon might not obtain in another locality, although the analysis indicates a strong municipal sewage.

"An experimental Dorr-Peck plant on a 200,000-gallon daily basis is now in operation at Urbana, Ill., under the direction of the Illinois State Water Survey Division. This experimental work was started under the supervision of Col. Edward Bartow. The Corn Products Refining Company is also installing a small experimental unit at its Argo plant, to test its efficiency as compared with other methods. This plant will operate chiefly on the factory waste waters. The experimental work will be directed by the staff of the Sanitary District of Chicago."

Determination of Pump Efficiency

A handy rule for computing the efficiencies of pumps for waterworks and other services is given, as follows, by the Blake Pump and Condensor Co., Fitchburg, Mass.:

The efficiency of any pump is determined by the relation of the amount of power applied to the amount delivered by it.

For example: 100 horse power is being consumed by a pump which is delivering 500 G. P. M. at 225 lbs. pressure. This duty is the equivalent of but approximately 65 horse power. Therefore, the amount of power absorbed in the pump by friction of operating parts, fluid, etc., is 35 horse power. This can be termed "Wasted Power" and in this case is excessive by about 25 horse power.

Perfect, or 100 per cent efficiency, is impossible, but proper designing, the use of first quality materials, careful workmanship and skilful operation will produce efficiencies within the range of 85 to 92 per cent, depending upon conditions.

The following is a simple method of computing pumping efficiencies:

$$\text{H. P. Consumed} - \frac{\text{Gals. per Min.} \times \text{Pressure}}{1710 \text{ (constant)}} = \text{Wasted Power}$$

If the wasted power does not lie within the range of 8 to 15 per cent of the total power cost it is not high efficiency.

Ranger's Water Supply

A permanent supply of water for the rapidly growing town of Ranger, Texas, has been one of the aims of the chamber of commerce of that city since its organization. The present supply is taken from a lake which receives the drainage from a considerable part of the city and has never been offered for drinking purposes, but only for manufacturing and fire protection. John D. Hawley was retained by the chamber of commerce and has reported on a supply to be derived from a point 9 miles east of the city, where a dam 1,600 feet long with a maximum height of 50 feet above bed rock would impound 1,500,000,000 gallons. There would be a 16-inch main line leading to the city, a filtration plant, pumping plant and standpipe. The estimated cost would be about $700,000. The chamber of commerce is considering the subject of financing the project, including the taking over of the distribution system and equipment of the local water company.

PUBLIC WORKS.

Published Weekly
by
Municipal Journal and Engineer, Inc.
Publication Office, Floral Park, N. Y.
Advertising and Editorial Offices at 243 W. 39th St.,
New York, N. Y.

Subscription Rates

United States and Possessions, Mexico and Cuba....$3.00 per year
All other countries .....$4.00 per year

Change of Address

Subscribers are requested to notify us promptly of change of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western office: Monadnock Block, Chicago

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FRANK W. SKINNER, Associate Editor

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Building Investigations

Some of the reasons why construction, especially that of buildings, has responded so slowly to the general improvements in the industrial and commercial situation, are being rapidly demonstrated by the investigations in New York of the Lockwood Senate Committee, which have disclosed a very serious local condition that there is good reason to believe is closely paralleled in other parts of the country.

It shows that three of the four principal factors in construction—labor, material and supply dealers, and contractors—are all to blame, and it may yet show that the fourth factor, capital, is not guiltless. While commencing with the individual heads of limited labor organizations where atrocious conditions were disclosed, it has neglected the more general field of labor union principles and policies, but has very effectively ventilated and attacked the conspiracies and unlawful combinations of important manufacturers, dealers and contractors themselves. In all of these three directions as well as with capital, the investigation should be most thorough and impartial and all misdoings should be exposed and punished and measures taken to prevent their recurrence.

More weight should, however, be given to the initial responsibility and the prime causes in many of these evils. A large proportion of the trouble started in the labor policies and its growth was possible only through the action of the labor leaders who have been permitted to enforce their arrogant and unjust demands so long that eventually the manufacturers and contractors were obliged to fight the devil with fire, with the natural result that in some cases equity has been forgotten and both sides have combined to rob the public outrageously.

Much credit should be awarded for the remarkable results secured by the committee, which, in only ten weeks' investigation, has already exposed thirty pernicious trade combinations, of which seven have been dissolved, and have eighteen more under investigation. It has secured one hundred and twenty-four indictments against individuals and firms and many more are to follow that together will require the entire efforts of four special grand juries.

The notorious head of the Building Trade's Council and his associates, several other labor union officials, representatives of commercial organizations, besides contractors, employers and others, have been indicted and more are to follow. Wherever conspiracy, intimidation or corruption can be proven they should be mercilessly punished and the investigation commended by all good citizens.

Points Overlooked

The enumeration in this issue of the principal obstacles to construction prosperity in this country omitted two important elements. The first is the very great delay, damage and uncertainty caused by inefficient transportation and by the strikes in public necessities and utilities, like the railroad switchmen, engineers, the tugboat crews, longshoremen, steel workers, truckmen, and coal miners, deliberately and avowedly intended to paralyze national activities.

The other point which affects not only construction but every phase of public welfare is the policy which has been, by every possible means, to conspicuously exempt from the war burden the largest part of the citizenry, namely the working classes, whose wages were raised to extravagant, disproportionate and wholly unnecessary amounts as fast as, or faster than, the cost of living increased.

This encouraged idleness, extravagance, inefficiency and discontent as excessive wages always do. It established government standards at fixed general prices and not only exempted practically all labor from even indirect taxation, but, in multiplying laborers' incomes at the same rate as their expenses or a higher one, multiplied also the

difference between them, thus giving them higher profits at the expense of all other citizens, especially those with any form of invested capital or in professional, intellectual and most skilled pursuits.

Obstacles to Construction Operations

Practical discussion by a general contractor and builder who emphasizes the great power of the hoisting engineers' union and the refusal of quotations by dealers in supplies, condemns the cost-plus form of contract, and recommends competitive bids and proposes cost investigation and price fixing by state and federal engineering commissions.

New York City, January 6, 1921.

Editor of PUBLIC WORKS.

Dear Sir:

As a general contractor and builder for more than twenty years in New York and throughout the United States, constantly in contact with the various unions and their delegates, I have watched carefully their methods especially during the last ten years. Having also noted the actions of the Lockwood Committee, and the trouble conditions, hold-ups and extravagance that have been going on for several years, I want to give you my views on the cause and remedy for the present serious conditions in order that you may get them before anybody interested and the public in general.

REASONS FOR INADEQUATE CONSTRUCTION

These conditions are, in my opinion, due solely to the outrageously high cost of building that has increasingly deterred capital, ruined small contractors and laid a frightful burden on the public. This high cost is attributable directly to three great causes—the high cost of labor, the attitude of large contractors, and conspiracy and extortion of the union labor leaders; and to three other important general factors—high cost of materials, policy of manufacturers and dealers, and the cost-plus form of contract.

Of these, the Lockwood Committee has so far investigated only three; a minor phase of the labor element, the high cost of materials, and the policy of manufacturers and dealers; which serious as they are, are not the chief or the controlling features.

LABOR'S RESPONSIBILITY

The heart of the matter is the high cost of labor which, directly or indirectly, represents four-fifths of the cost of construction, which cannot have a low price while labor has a high price. So long as the general public is hypnotized to bleat for maintaining "high living standards," and unabated wages demanded by the labor demagogues and politicians, and while many contractors themselves have profited by the exorbitant wages, the latter will continue, even with reduced construction. When the public demands lower wages and really wants them, they will come.

Throughout the country the hoisting engineers, who handle all materials for every kind of construction, hold the key of the situation and do not hesitate to use it. They alone are sufficient to control every important job and are more powerful and more mischievous than the unions that already have been investigated. In New York they are thoroughly endorsed by the enforcement of police regulations framed in their behalf so as to make it practically impossible for outsiders to supply a shortage of hoisting engineers in this city.

COST OF MATERIALS CAN BE GREATLY REDUCED

The high price of materials is due directly to the high cost of labor, profiteering, uncertain transportation, and under-production. The present senate investigation should be of some value in exposing conspiracies and violations of the law, but so far has shown no disposition to adequately investigate or reduce the high cost of labor.

Profiteering could be curbed, if not eliminated, by the appointment in every state of a commission, headed by experienced engineers, with jurisdiction to investigate the production, sale and distribution of all kinds of materials, to determine the cost and reasonable profits and prices and with authority to enforce their decisions. These state commissions should be co-ordinated under Federal supervision, which should be thoroughly competent and honest and uninfluenced by politics, by labor, or by manufacturers.

PERNICIOUS TYPE OF CONTRACT

The cost-plus percentage form of contract encourages rather than discourages high prices and high costs of all kinds connected with building construction. While it expedited and simplified some of the very urgent construction necessary in the war emergency, and could then be accepted as one of the sacrifices that patriotic citizens were prepared to make for the safety of the nation, the excuse for its existence in 95 per cent of present and future contracts has passed, and it should be eliminated, despite the protests and arguments of some contractors who have profited unduly by it and find in it a sure cure for all business risks, a relief from careful estimating and planning, and a way to secure assured profits, increasing with the cost of the work.

The attitude of some large contractors is, as some of them openly express it in a slogan, that they are "builders, not bidders," that they do not compete in the proper sense of the word; that they take no interest in the reduction of cost because the owner must ultimately pay it in any event; and because, in most of the important work at present under construction, the more expensive the job, the greater the contractor's profit.

COMPETITION AND EFFICIENCY INDISPENSIBLE

Construction work should be on a truly competitive basis, and if a contractor's experience,

ability, resources and ingenuity do not enable him to work profitably on it, he should not be in the construction business. The cost-plus percentage contract puts a heavy premium on extravagance of all kinds, on paying the highest possible price for labor and materials, on doing the work slowly, on the use of unnecessary plant and equipment, and on charging it with unnecessary burdens.

If contracts are not awarded for a lump sum, or for unit prices that often may and even should be adjusted by a sliding scale, they should be executed under rigid supervision for actual necessary cost plus a fixed fee, equivalent to paying for superintendence merely, or on a lump sum basis with a profit and loss sharing arrangement by which the contractor shares both expense and savings on either side of a predetermined and accepted working estimate.

DESTRUCTIVE POLICY OF LABOR UNIONS

The conspiracies and extortions of union labor leaders, who have absolute and unlimited control of labor organizations, are due to the tremendous amount of graft, easy money and other kinds of profiteering that the organizations provide. Their treasuries contain many, many millions of dollars that keep the agitators in soft berths and afford rich pickings to the leaders.

The unlimited power of the leaders enables them to dictate the most oppressive and humiliating terms to employers, to call strikes on any pretext or on none, to impose and collect extortionate fines from owners for infringement of arbitrary union rules. It limits the production and efficiency of the men, and by excluding non-union or non-local workers, creates an artificial shortage of labor.

CONSTRUCTION IN SPITE OF UNNECESSARY COSTS

Labor conditions are such, prices are so unnecessarily high, and fluctuations are so great, that it is dangerous to make bids at reasonable figures, and very difficult to fulfill the contracts when they are awarded. There is in New York and some other places a considerable amount of building construction in progress for owners who are extravagant or who, for pressing business considerations, are willing to disregard outrageous demands to prevent interruption of the work, as in the case of the Cunard building on lower Broadway, where, it has been brought out by the investigation of the Lockwood Committee, hundreds of thousands of dollars were paid.

This class of work and a large amount of various kinds of Federal, state and municipal construction demanded by the public for the purpose of affording employment, will be carried on during the present year, but without some important changes in present conditions, ordinary construction, especially the building of at least 1,000,000 homes at a minimum cost of four to six billion dollars, will make little headway until conditions reach a crisis that may bring violent changes.

Wages are high or low according to the proficiency and production they command. The present scale is due to the government's yielding to labor's demands, to the profiteering and graft of labor leaders, to the municipal, state and Federal requirements for paying the "prevailing rate," paying percentages of profit on pay rolls, to the scarcity of skilled and unskilled labor and to the inefficiency of labor.

PIRATICAL DEALERS

The extortionate demands of some manufacturers and dealers, increased by the contractors' percentages, have been passed on to the public, who have to pay huge prices for small quantities and even for inferior qualities. Some dealers have also refused quotations necessary for making estimates, so that contractors must either bid very high for reasonable protection, thus losing the work, or bid low to secure it and then be in danger of heavy losses on their purchasing.

At present, or very recently, it has been impossible for contractors in this part of the country to purchase any more material than is needed for the specific job, or to secure any quotations whatever for future deliveries, even within strictly limited time, for brick, cement, sand, stone, lime or plaster, and probably for some other important commodities. This for about a year has been one of the worst features responsible for the slump in construction work.

With open markets and lower prices based on actual values and efficient methods both for materials and labor, with a real and general determination to bring down the price of construction labor to at least the same proportion as is already being accomplished in shops and factories and with a proper form of contract, there is no reason why construction and building should not rapidly attain and long maintain unprecedented volume and prosperity in this country.

Yours truly,
DENNIS E. CONNERS.

More Paving Bids Received

The State Highway Commission of New Jersey received evidence on December 1 of improved conditions so far as securing highway contracts is concerned, having received upon that date twelve bids for grading the Ancora-Atco section of Route No. 3. The contract was awarded to the Weldon Construction Co. of Westfield for $56,883.90. The highest bid was $128,903.85, or more than twice as great.

Buffalo's Improved Water Supply

Tests of the water supply of Buffalo, N. Y., from the point of view of fire protection were made in 1916 by the National Board of Fire Underwriters, which found that "only about 25 per cent of the water required for good protection was available in much of the congested business section." Under date of December 30, 1920, the board publishes a special report in which it says that "the protection available from the public water supply to the congested value district . . . has been so improved that it now meets the full requirements." Part of the gain is due to reduction of waste by metering and extensive cleaning of mains.

North Carolina Highway Construction

Wythe M. Peyton, state highway division engineer for the mountain district, division No. 1, North Carolina, reports that a total of 30.84 miles of the 487.28 miles of good roads planned has been constructed during the past 12 months. The estimated cost of construction is placed by the engineer at $6,621,822.57. To show the increase in activity in the highway division, Mr. Peyton quotes the fact that whereas in June, 1919, the work included only one division engineer, one stenographer and one survey party of five men, there are now all told one division engineer in charge, one assistant engineer in charge of location work, one in charge of construction work, one stenographer and seven survey parties of seven men each, together with eight inspectors on concrete and asphalt construction.

Snow Removal from Country Roads

Methods employed last winter and adopted for this one in Pennsylvania, Indiana, Michigan, Illinois, New Jersey, Massachusetts, Connecticut, Maryland and New York. Preventive methods, including snow fences. Methods of handling snow.

Last week we discussed the removal of snow from city streets, and until within a few years past little snow removal work was done outside of the cities. With the enormous development of automobile traffic, and especially of trucking and other commercial traffic, the importance of keeping at least the main highways open has been generally realized throughout the country. For instance, during the year 1919 the daily tonnage carried over a section of the highway between New York and Philadelphia averaged 2,503 tons in the spring, 2,129 in the summer, and 2,092 in the winter; the average for the year was 2,391, and the winter traffic was only 12 per cent less than the average. The following information concerning removing snow from highways is abstracted from a summary of the present practice in the numerous states by J. L. Harrison, senior highway engineer of the Bureau of Public Roads, in a recent issue of the publication of the bureau.

Pennsylvania has led in the matter of snow removal and expects to do more this winter than ever before. The state has equipped 75 additional trucks with snow plows and is increasing its other mechanical facilities and its snow removal organization. The state is mountainous, it is traversed by several very important through highways and the snowfall is heavy. More snow fences are used in the state than anywhere else in the country and this has done much to prevent the drifting of snow across the roads.

In the equipment there is no feature differentiating Pennsylvania from the other states except that the percentage of V-shaped plows is greater. Perhaps its most distinctive feature is that, because the right of way is kept scrupulously clear of weeds, brush, etc., obstructions of all sorts are removed wherever possible and snow fences are used liberally, the cost of keeping the roads clear is as low as $50 to $200 per mile.

Perhaps the most important and unusual feature of Pennsylvania's snow removal program is its co-operative arrangement with the weather bureau by which the highway department is informed in advance of the approach of storms. This information is at once sent by the department to its field engineers and they arrange in advance of the storm for the necessary amount of machinery and men to fight it. In the case of a storm lasting several days it is of the utmost importance that the snow fighting be continuous until the storm has passed, since a few hours' cessation might so block the road as to prevent the use of snow plows and other snow removal appliances. In a severe storm a crew can be depended upon for only a limited period before resting and therefore it is absolutely essential that reserve forces be on hand to keep up the fight; and special emphasis is placed by the department upon this feature of the snow fighting. If any point on the main routes is blocked for more than 24 hours, a flying squadron of men and equipment is sent from headquarters and men are drafted from other near-by sections until the regular men and equipment on the section in question are able to cope with the situation.

Ohio. In Ohio the responsibility for snow removal rests with the counties, towns and townships, but the state highway department publishes valuable instructions and sends its engineers to advise and assist when requested. There is to be a definite effort to keep open the important routes through the state this winter, but as the state has no legal powers in the matter it is not yet certain just how completely this plan can be carried out.

Indiana. In Indiana the state highway department has ample funds and full authority for snow removal, but this has never before been undertaken on a large scale and, generally speaking, the snowfall in the state is not heavy enough to cause much obstruction of traffic. It is believed that no definite plans have been made by the department for handling this winter's snowfall.

Michigan. The state highway commission of Michigan did a good deal of snow removal work

last winter and is planning a more extensive program for this one, expecting to keep all the state routes open. In the north, where the snowfall is heavy and the traffic light, the snow will be rolled, but further south plows will be used. During the fall, obstructions were cleared from the right of way, tight fences and hedges removed, snow fences installed, and machinery prepared for action.

Illinois. In Illinois the state highway department has maintenance control over only those sections of the state system on which paving has been completed, and at present this includes only two important routes, from Chicago north to Wisconsin and from Chicago to Clinton. However, only about once in three years is the snowfall heavy enough to obstruct traffic, and even then only when it drifts. Moreover, there are few cuts on the two routes named. However, the department has plenty of snow removal equipment should it be needed.

New Jersey. During the winter of 1919-1920, the state department of New Jersey kept 280 miles of highway clear at an expense of $77,710, or an average of $278 per mile. The actual cost varied largely, however, one short stretch on the main road between New York and Philadelphia having cost $4,327 during February alone, in this case ice as well as snow having to be removed and the drainage conditions being unfavorable. This winter it is planned to keep open the entire 700 miles of state highway department routes. Some snow fences will be used.

In this state it is customary to start clearing on a width of 30 feet or as near that as possible. The plows are ordered out as soon as 2 or 3 inches of snow has fallen and are worked 24 hours a day while the snowfall continues. As successive storms are plowed back from the road the open space gradually narrows, but is not permitted to become less than 18 feet.

Massachusetts. In this state private interests are looked to to a very large extent for keeping open the roads, the highway department having only $50,000 available which will be used chiefly for a general supervision. In this state the main highways are used very extensively by manufacturing interests for transportation of raw materials and partially manufactured products and the highway department endeavors to secure a cooperative agreement between the manufacturing companies, large trucking companies and the cities and towns. The state will supply snow plows, while the trucks and men are expected to be furnished by the private and public corporations interested in having the roads kept open. It will be interesting to see from this winter's experience how this plan will work out.

Connecticut. The Connecticut state highway department removes snow from the state highways, obtaining the necessary funds from automobile license fees. Sufficient equipment is available for ordinary snowfalls. Last year's snow was removed from about 1,000 miles of road. No changes from last winter's program was anticipated.

Maryland. In this state the snow problem is not serious except in the mountains of the western section. Here, however, the snowfall is heavy and lasts until late spring. No attempt has been made to keep the roads open heretofore, but this winter the roads commission is planning to keep open the roads from Washington through Baltimore to the Delaware line, from Baltimore to Cumberland and western Maryland, from Baltimore to Annapolis and to Solomon's Island and Point Lookout. At least 20 4-wheel-drive trucks are equipped with plows for this purpose.

New York. In this state the law places the responsibility for snow removal on the local authorities and so far it has seemed impossible to devise any method for state control of snow removal.

SNOW PREVENTION METHODS

Methods of handling the snow problem are generally classified as snow removal and snow preventive methods.

Preventive Methods. The greatest difficulties and expenses in snow fighting are caused by drifting. Snow drifts are formed on the lee side of obstructions. Prevention of the formation of drifts begins with the removal from the right of way of anything that may cause drifts. A growth of weeds or grass of not more than a foot or two high causes drifting when the wind is right, and more drifting is caused by weeds and brush allowed to accumulate along the roadway than in any other way. Hedges are next in importance and these should be removed wherever experience has shown that they cause trouble. In many regions the winds that carry snow are so uniformly from one direction that only a relatively small fraction of the hedges need to be removed. Stone fences, rail fences, picket fences and all tight fences often cause drifts, and these should be taken out and wire fences substituted. Where rows of trees cause drifts to form it will generally suffice to trim the branches well up from the ground, although sometimes the entire tree must be removed. Where removal of trees, hedges, etc., conflicts with roadside beautification and home and town improvement, it may be that the removal of them will cause more trouble of another kind than the removal of snow which was occasioned, and good judgment must, of course, be used in the matter.

In addition to the above, drifting may be caused by the topography of the country, such as a hill that affects the air currents or a cut so placed that it catches flying snow. Under such conditions a good deal can be done by erecting snow fences. These should be so placed as to cause the deposit of snow on the lee side of them before it reaches the road. The fences are therefore placed from 50 to 60 feet from the road on the windward side. They may be either permanent or portable, but the latter are generally preferable, for they can be set up on farm lands after the crops have been removed, and removed in time for the spring plowing.

Snow fences are generally of either the board

fence type or the picket type. The former as designed by the Ohio state highway department, is shown in the accompanying illustration. The portable board fence differs from the permanent installation only in that it is made up in sections of convenient length and held in place by stakes rather than by set posts. Picket fences are often used for portable ones, the best one being of light pickets held in place by a number of strands of heavy wire. These can be attached readily to driven posts and when not in use can be rolled up and stored away.

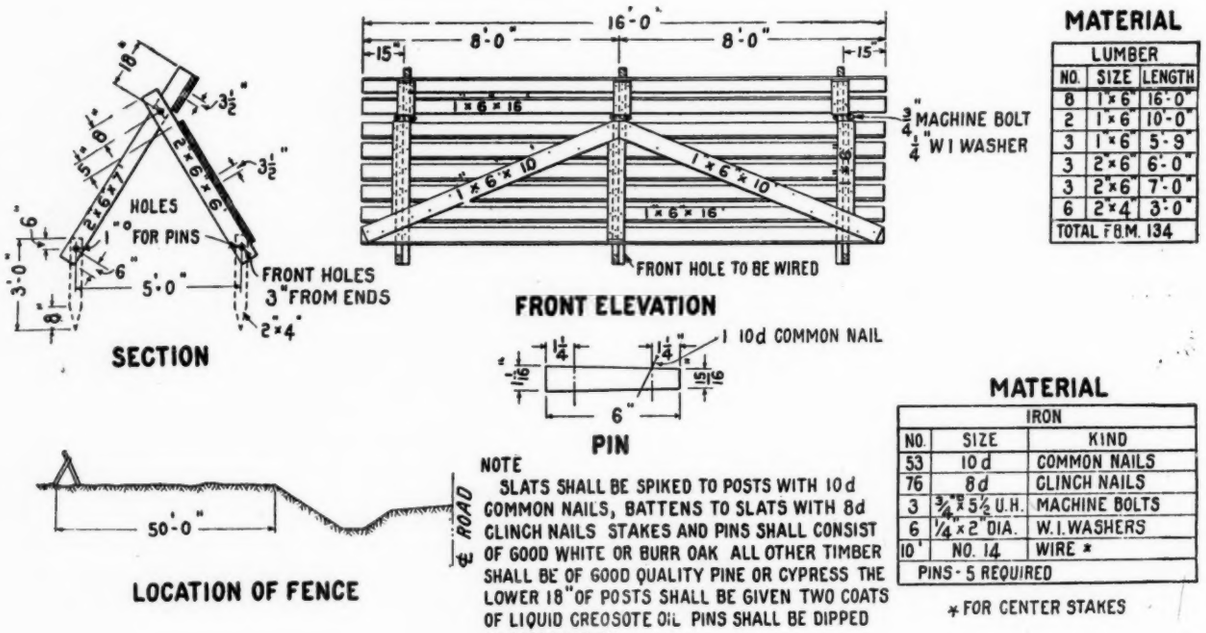
REMOVING SNOW

There are only two methods of keeping roads open to traffic where snowfall is heavy—compacting it and removing it. The former serves the purpose where traffic is light and consists principally of horse-drawn vehicles and a few light automobiles. But it is wholly unsatisfactory where many automobiles or heavy trucks use the highway, for these are apt to become stalled, and also ruts are formed and the road surface at the bottom of them seriously damaged. Snow is compacted by rolling it after every snowfall with a roller 6 or 8 feet in diameter and 10 to 12 feet long, with the ends closed. (See "Municipal Journal" for February 8, 1919.)

Snow may be removed by plows or by hand. Rotary plows have been used but are not common in this country. Ultimately, however, Mr. Harrison believes that the heavier snowfalls will be handled by some form of apparatus resembling the modern elevator grader. Such a machine might clear the full width of the highway at a single cut and by using a fast-moving belt discharge the snow well away from the line of travel and where it would tend to prevent further drifting. The present practice, however, is to push the snow to one side by means of blades. Road graders may be used, but the most common practice is to fasten a heavy blade ahead of a heavy truck. Sometimes when the snow is deep a second truck is hitched ahead of that carrying the plow.

The snow may be moved from the center to both sides, but in order to prevent drifting it is better to remove all of the snow to the leeward side of the road. Even then some drifting may result, but much less than if the snow were piled on the windward side. The first clearing should be at least 10 feet wider than the traveled way, this extra space being used for receiving the later snowfalls as they are pushed aside. Success in this work consists in getting the plows onto the job early enough and keeping them at work continuously. A well-driven truck can handle about 10 miles of highway. One and preferably two assistants should accompany the driver. If a heavy blanket of snow is being removed, half a dozen men with shovels should go out with the truck. Under normal conditions a truck should make one cut an hour, but as it takes four full cuts to clear the necessary width at the beginning of the season and generally three during the later months, the truck at each cut will have 4 hours' deposit of snow to remove. But if it is started early and kept running continuously it will not often happen that other methods have to be resorted to.

However, if drifts have formed it will often be impossible to find space to store the snow that must be plowed out if the cuts are to be kept clear. Under such conditions the usual method is to have men with shovels clear away the drift by hand. This kind of work is expensive, but points where drifts form are those where the greatest width of cut is needed to permit the plows to operate to advantage, and they must be cleared to sufficient width or otherwise they will



PORTABLE SNOW FENCE DESIGNED BY THE OHIO STATE HIGHWAY DEPARTMENT

be blocked at once with every snowfall and hand shoveling must be used almost exclusively in them.

For hand removal it is important to use large scoops. Even at some additional first cost, the snow must be so piled that it will hinder rather than assist the re-filling of locations that have been cleared. Where the cuts are both wide and deep it may be cheaper to load the snow in trucks and remove it entirely, but this is not generally advisable. Rotary snow plows would be of especial advantage in these deep drifts and, although they have not yet come into very general use, it is thought that such use is bound to increase. "Just how rapidly this change in snow removal equipment will be made will depend upon the development of satisfactory rotary plows, but it can hardly be put off much longer, for the cost of shoveling out deep drifts is very expensive." A plow of this kind was illustrated and described in PUBLIC WORKS for April 24, 1920.

Preservative Treatment of Wood Poles

Causes of deterioration, methods of prevention and economies of pole treatment. Coal tar derivatives used.

Under the above title a circular has been issued by Purdue University in an effort to answer quite fully a number of requests for information on this subject which the School of Engineering has received. While most of the practices, experiences and specifications drawn upon are those of private telegraph and telephone companies, municipal and other public works officials are interested in the permanance of poles used for carrying wires along streets and highways.

The pamphlet treats the subject quite exhaustively, devoting 51 pages of text and four pages of index to the matter. It describes the causes of deterioration of poles and methods employed for prevention, including the use of coal tar and other preservatives; treating poles by means of brush, spraying, pouring, open tar dipping and open tar hot and cold bath, together with the preparation of the poles for treatment. It also describes the economics of pole treatment and method of preserving poles already in service. It describes the results of inspections made of treated and untreated poles in Indiana, cites experiences in other locations, quotes specifications employed by the American Railway Engineering Association, the National Electric Light Association, the United States Shipping Board Emergency Fleet Corporation and the American Telephone and Telegraph Co.

It gives a summary and conclusions of the results of the study made of the subject, which summary is as follows:

1. A survey of the state of Indiana was made and showed that a considerable percentage of the poles erected at the present time are receiving some kind of treatment. The majority of pole-using companies are either using preservative treatment or planning to use it on future work.

2. The most commonly used preservatives in this country are derivatives of coal tar. Dead oil of coal tar or creosote oil and the higher boiling oils known as carbolineums are the most satisfactory preservatives. Coal tar itself should not be used as it has little value as a preservative, and "mixed creosote oils," those containing undistilled products, cannot be recommended.

3. The commonly used treatments in Indiana are the brush treatment and the open tank treatments either by dipping or by the hot and cold process. Poles of less durable woods treated by the pressure tank process are as yet more expensive than butt treated cedar and chestnut poles and so have not come into extensive use.

4. A study of the economic side of pole preservation shows that under average conditions an increase in life of about 2 years will justify brush treatment, about 3.5 years will justify the open tank dipping treatment in hot creosote and about 7.5 years will justify the hot and cold bath open tank treatment. The results of the inspections made in various parts of Indiana, indicate that an increase in life greater than that necessary to justify the treatment may be expected for these treatments if they are applied properly.

5. It is possible to increase the life of poles already in service to some extent by reinforcement and treatment after setting. The most commonly used method is the process of reinforcing by setting a creosoted stub along side the weakened pole and binding the two together by wire. Another method used is that of excavating the earth from around the pole, clearing away decayed wood and applying a brush treatment. Concrete reinforcement has been applied to some extent but on account of the cost can be recommended only for exceptional cases where the cost of replacement of the poles is very large.

6. The selection of the proper method of treatment to be used depends upon local conditions. For the lighter lines and for the smaller companies, or where first cost is an important consideration the brush treatment offers some advantage. The open tank dipping process known as Specification "AA" is preferred by some on account of greater uniformity and probably somewhat longer life than the brush treatment which advantages are considered to overbalance the increased cost. The hot and cold bath open tank treatment gives the greatest increase in life and is particularly suitable for heavy lines and permanent construction.

Galveston's Sea Wall

Following the storm of 1900, which caused the overflowing of a large part of the city of Galveston, Texas, a sea wall about five miles long and 17 feet high above mean low tide, was built and completed in 1904 at a cost of slightly over $2,-

000,000. For some time past an extension of this sea wall has been under construction by the federal government, and it is predicted by Major L. M. Adams, the engineer in charge of the work, that this will be completed by August 1, 1922; 9,110 feet have already been constructed and about 1,200 feet remain to be built. Although the original wall about five miles long cost about $2,000,000, the two miles being built by the government will cost about $1,500,000, owing to the greatly increased cost of public works during the past few years.

Wire Rope Fastening

Wire rope attachments, made in the field, are seldom capable of developing the full strength of the rope; the common method of forming a loop eye with the loose end clamped to the standing part, although simple and rapid, is not very reliable, is likely to slip, is subject to injury by meddling and may not be more than 60 or 70 per cent efficient. Any fair mechanic can, without any special tools, secure a forged socket to the end of the rope that will provide a clevis or pin connection of full strength that once made is far more secure and easily and rapidly shifted than the clamped connection.

Reliable instructions for making wire rope attachments are given in a recent issue of the "Excavating Engineer," which says:

"The rope may be attached to its load by means of a socket, or it may be bent back on itself to form an eye and the loose end clamped to the rope with rope clips or clamps. Properly done, the former method of attachment develops the full strength of the rope, but it has several disadvantages.

"Poor workmanship is concealed, showing only when the rope slips or breaks in the socket; it cannot be readily inspected; the rope is rigidly held in the socket and the effect of bending is concentrated just above the socket; and it is much more difficult to make.

"The latter method, fastening by clips, develops at most only about 85 per cent of the strength of the rope, usually not more than 80 per cent. It bruises and crushes the rope where the clips are applied, and is liable to slip; but it can at all times be readily inspected and requires little skill in making. Rope makers, however, recommend the socket method of fastening, and if properly made it never fails. After either a socket or clamp attachment is made, it must always be tested by making several trips under a heavy load.

"The method of making the best socket joint is as follows: The rope should be securely seized or bound at the end with soft iron wire before the end of the rope is cut square. An additional seizing should be placed on the rope, a distance equal to the length of the socket from the end.

"After the rope is trimmed off, the seizing on the end of the rope should be taken off, the rope opened down to the second seizing, the hemp center cut out the wires broomed out. That is, they should all be untwisted but not straightened. Then the wires should be thoroughly cleaned in benzine, naptha or gasoline, as far as they are to be inserted in the socket, and then dipped in commercial muriatic acid for 30 to 60 seconds until the acid has cleaned each wire.

"Next, the rope end should be dipped in boiling water, to which a small amount of soda has been added, to clean off and neutralize the acid. Then the rope end is inserted in the socket and warmed if the temperature is below 65 degrees Fahrenheit, to prevent cooling the zinc too rapidly. The socket is placed with its axis vertical and coinciding with the axis of the rope, the bottom is sealed with clay or putty, and molten zinc or spelter, heated to a temperature that will just char wood, is poured into the socket until it is full. Lead or Babbitt cannot be used in this method because they will not solder the wires to the filling material as zinc will. Use only a good grade of zinc. Such a rope socket, attached carefully with good material, will hold and give nearly 100 per cent efficiency of the rope strength.

"Should it be impossible to obtain good zinc to make a socket fastening as described above, then the older method usually called 'loading of sockets,' is more reliable. In this case the wires of the rope are cleaned at the end as described above with the material on hand. Then the socket is pulled over the rope and every wire is bent back by means of pliers for 1 to 1½-inch length. Next the rope is pulled back into the socket and molten lead or Babbitt poured into the sockets. With this method we have no soldering effect between the wire and the filling metal and the wires are holding depending on the hook formed at their end. Naturally the wires will be distorted, subject to uneven tension at the end of the socket, reducing the efficiency of the joint."

El Paso Irrigation Project

Efforts are being made to utilize the full potential value for irrigation and power purposes of the Elephant Butte dam completed in 1916 at a cost of $10,000,000. At present 546 miles of irrigation canals have been built, sufficient to serve 115,000 acres of which last year 80,000 acres were irrigated and their value has increased to from $50 to $350 per acre.

It is now proposed to extend the project by the construction of a high-line canal to irrigate Palomas valley and Fort Hancock valley, and that another high-line concrete canal be built to divert all the water of the river at Leesburg, developing three water-power plants at the dam, at Tortugas and at Canutillo, with a total development of 33,000 h. p., the estimated cost of which is $4,000,000 and the estimated revenue $500,000 per year. The extension to the city of El Paso to furnish it with abundant power for all purposes will cost $1,000,000. The estimated value of the irrigation canal is $3,500,000, and its cost $2,250,000. It is proposed that if the government will pay for the cost of this canal, other interested parties will raise $5,000,000, thus providing for the entire construction and the full development of the water supply.

Construction Questions Answered

Suggestions as to methods, "wrinkles" and appliances that may be used to overcome difficulties arising in construction work. We invite questions concerning such problems that may arise from time to time in the experience of any of our readers. Answers prepared by competent authorities will be published promptly. It is hoped that others who have solved similar problems different will send us their solutions for publication also; or describe new "wrinkles." If it is only a new way to drive a nail, it may help some one

How Can Submerged Water Pipes Be Installed?

Can be lowered from floats, from falsework, or from the ice. Can be hauled longitudinally on the bottom, can be laid with submerged cradle, floated to position and sunk, or sometimes laid in cofferdams.

Water mains frequently have to be laid under water for the crossings of rivers, inlets and harbors, and the installation of the submerged portions may present difficulty and unusual conditions to the contractor, even if he is familiar with ordinary pipe laying in land trenches.

The conditions and requirements vary so much in different jobs, depending on the type, diameter and length of pipe, the depth of water, character of the bottom and approaches, the location of the line, navigation, available facilities, and urgency of the work, that no universal instructions can be laid down, but it is possible to review a number of practical methods that have been found satisfactory under certain conditions and may be repeated or modified for similar or varying requirements.

For water of moderate depth and velocity and soft bottom, and where operations are not restricted by navigation requirements or danger from flood or storm, submerged pipes up to 10 or 12 inches in diameter and two or three hundred feet long, can usually be installed without serious difficulty or great additional expense, by any contractor competent to lay similar pipes on dry land.

Where the pipe is very much larger, or the conditions are more difficult, special methods and appliances may be required and careful precautions necessary and the work should be done by or under the supervision of a competent engineer or an experienced contractor who has previously specialized in similar submerged pipe-laying. Although riveted steel pipes, wooden stave pipes, or reinforced concrete pipes may be laid under water, their use for this purpose is comparatively infrequent and their dimensions are likely to be large so that their installation requires special skill and experience and will not be here considered. The pipes that are here considered will therefore be assumed to be of the commonest type, namely, cast iron pipes with lead caulked hub and spigot joints about 12 feet apart.

FOUNDATIONS

The pipe should be laid at a depth of one or more diameters below the surface of the bottom according to the character of the material on which it rests, but in very soft mud or silt it may require the construction of special foundations. These will usually consist of pairs of piles forming transverse bents with caps on which the pipe is supported. For small pipes the foundation piles may often be driven in pairs with their upper ends connected by caps or cross-pieces bolted on a little below the tops, the two piles being handled as a unit and their extensions above the cross-piece serving as guards to secure the pipe, which is lowered vertically to rest on the cross-pieces. If necessary, the piles may be driven separately, cut off by a submerged circular saw, and capped by a diver who can also adjust and secure the pipe in position. Sometimes wooden saddles or pillows supported on grillages or mud sills are used instead of piles to support the pipe on soft bottom.

If there is only a thin layer of very soft material with harder bottom beneath, it may be permissible to allow the pipe to sink through the soft material by its own weight and become embedded in it on the harder material below without special foundation, or rock or other very hard bottom in shallow water may require to be drilled and blasted to provide a trench to receive the pipe. In deeper water where there is little or no current or danger from navigation it may suffice to lay the pipe on the bottom and cover it with a protection of clay, gravel or broken stone.

TRENCHING

In ordinary earth bottom the installation of the pipe should be preceded by the preparation of a full-length trench of the required depth which can generally be excavated by a drag-line machine, by any available dredging machine, or by clam-shell or orange peel buckets operated by a derrick boom and hoisting engine.

In some kinds of bottom the pipe can be laid on the surface and undermined from end to end by a hydraulic jet or suction pipe which scours out the material directly underneath and allows it to gradually sink to the required position. Such a method would require the special approval of the engineer in charge.

HAULING LONGITUDINALLY TO POSITION

Where the approaches to the ends of the submerged pipe are slopes tangent to it, a portion, at least, of the approach trench can be maintained

open at one end, the pipe can be assembled and the joints made in the trench on shore and the pipe hauled across the river in the previously prepared trench by means of a rope attached to it and operated by a windlass or hoisting engine on the opposite shore. All of the pipe may be assembled and jointed in the trench and hauled across at a single continuous operation, or one or more lengths may be assembled and jointed at the water's edge and pulled forward until the rear end is nearly submerged and another section or sections added and the whole again pulled forward, and so on. If all of the pipe is completely assembled on shore before hauling is commenced, it should be supported at each joint in cradles sliding on skids or supported on ways or rollers to facilitate its longitudinal movement.

Unless the pipe is very thin and light, the forward end should be plugged watertight to keep the interior dry and increase the buoyancy so as to reduce the submerged weight and friction of hauling. If the pipe is more than 12 inches more or less in diameter, the buoyancy of the enclosed air is greater than the weight of the pipe, thus producing a tendency to float which must be overcome by admitting a certain quantity of water to the pipe, or, in some cases where it is needed for other purposes, by enclosing the pipe in its concrete jacket. The forward end of the pipe should, in any case, be provided with a conical pilot and have proper attachments for the hauling line. The hauling will also be facilitated if two or three full-length longitudinal strips of wood are attached to the under side of the pipe to form runners that will diminish the friction on the river bed and prevent the bells or hubs from digging into the soft ground.

Except for very short lengths of pipe, special precautions must be taken to prevent the longitudinal tension of hauling from pulling the pipe apart at joints. The hauling line can be fastened to a continuous steel rod or timber lashed to each section of the pipe at the joint in such a way as to be detachable after the pipe is installed. Or collars can be put around the pipe at joints and connected by tension members adjusted to some initial strain and permanently left in position or removed after the pipe is installed if arrangements for this are provided. A very simple joint reinforcement can be made with three or four equidistant heavy longitudinal wires secured to lashings of smaller wire fastened at successive bells. These can be put under heavy initial tension by stressing with simple levers that can maintain the stress while the ends of the longitudinals are fastened to the lashings by finer pliable wire.

If the bottom is flat with gentle slope, ordinary joints with the necessary tension reinforcement may suffice, but if the bottom is irregular or if the alignment has any sharp vertical or horizontal bends, flexible joints must be provided. These can be secured by application of the ordinary Ward joint or some other type of ball-and-socket or adjustable connection at the required points.

LOWERED FROM FALSE WORK

Where the depth of the water is moderate and navigation does not have to be maintained, piles can be driven on both sides of the alignment and capped above the water to support the pipe assembled and jointed on it. Ropes or slings can be placed under the pipe at joints and connected to tackles suspended from the top of the falsework, the original supports removed, and the pipe lowered by slacking off the tackles slowly and with great uniformity at given signals. If the pipe is not too heavy, the tackles may be replaced by simple ropes, each passed two or three times around a beam or snubbing post with rounded corners. The loose ends of these ropes must be handled and the slack held by careful, reliable men who simultaneously pay out a small given amount on signal, thus gradually lowering the pipe to position.

If the work can be done when the water is covered with heavy, strong ice the pipe may be assembled and jointed on transverse sills laid on the surface of the ice in the plane of the alignment and when all is in readiness the ice can be broken through on longitudinal lines each side of the pipe and, the narrow detached strip of ice underneath it being removed, the pipe can be jacked up to release the original sills and transfer the weight to transverse timbers above the pipe, spanning the opening, and from which it can be lowered in the same manner as from falsework.

LOWERED FROM FLOATS

If the pipe is provided with flexible joints at intervals of not more than 100 or 150 feet, allowing it to be safely deflected to a considerable angle, it can be assembled on or between pairs of rafts, scows, pontoons or other floating platforms and the successive lengths can be lowered from them after the joints have been completed in the same manner as the pipe is lowered from falsework. Care is, of course, taken to always keep the forward end of the inclined portion of the pipe safely secured above the surface of the water and to maintain the floats with reliable moorings and protect them from navigation, drift and current so that they shall not be displaced and carry the pipe out of position.

FLOATED TO POSITION AND SUNK

A long line of small pipe may sometimes be advantageously assembled and jointed on blocking, sills, or launching ways just above the surface of the water, in a sheltered position. Pairs of empty oil barrels or other casks may be secured to do it with detachable connections and the pipe carefully launched by removing or lowering the support or by transverse movement of such a nature as not to cause serious friction or stresses. The pipe may then be towed to position and lowered in the vertical plane of its required alignment, sufficient water being admitted to make its specific gravity slightly greater than unity. It may be lowered by simultaneously or successively cutting the lashings to the floats. The lowering should be further safeguarded by

several pairs of suspension ropes, slings or hoisting tackles attached to it at intervals to prevent any displacement or irregularity.

PIPE LAYING WITH INCLINED CRADLE

Large, heavy pipes can be laid in deep water where obstructions to navigation are not permitted, by making all of the joints flexible and assembling the pipe lengths at the upper end of an inclined cradle or launching ways reaching from the working platform to the bottom of the river and gradually receiving it in advance as the pipe is laid from one shore to the other.

For deep water and heavy pipe the cradles become massive, trussed structures long enough to have an inclination of approximately 45 degrees. They are hinged to the boat, pontoon, or other float on which the pipe is assembled. The pontoon is securely moored in position and as each pipe length is added at the upper end it is moved backwards, allowing the lower end of the cradle to drag along on the bottom of the river and be pulled out from under the stationary pipe which drops to the bottom and adjusts itself to the irregularities as it is deposited there. This method requires exceptionally efficient joints that will not be injured by the considerable stresses of installation. A notable example of this successful operation was in the laying of several thousand feet of large pipe crossing the narrows from Long Island to Staten Island in water more than 60 feet deep.

No matter what the method of laying submerged pipe, if the joints are not of suitable character and well made they are likely to develop leaks due to the stresses of installation. In any event they should be thoroughly examined by reliable divers after the work has been completed. If many leaks are found their elimination is likely to be very costly and tedious, so that it is expedient to omit no precautions to prevent their occurrence.

PIPE LAYING IN COFFERDAMS

In shallow, sheltered, still water where there is good bottom, preferably clay, it may sometimes be expedient to build a cofferdam of sand bags, embankment, puddle, sheet piles, or a combination of them, unwater it, and install the pipe in the manner usual in open trench. When this is done it will usually be best to build the cofferdam in successive sections of moderate lengths ,completing one before another is unwatered and thus economizing on cofferdam materials, maintenance and pumping.

For very long lengths of submerged pipe not installed by the cofferdam method, it may be advisable to lower the pipe in several long sections independently, enclose the adjacent ends of these sections by cofferdams, pump out the water and make the special connections in the dry. Otherwise adjacent sections may be connected by divers with special adjustable sleeve lengths.

After the pipe has been installed and tested it may require to be artificially backfilled, but in many cases the trench will be rapidly filled by the action of the water itself and thus automatically provide sufficient covering to protect the pipe.

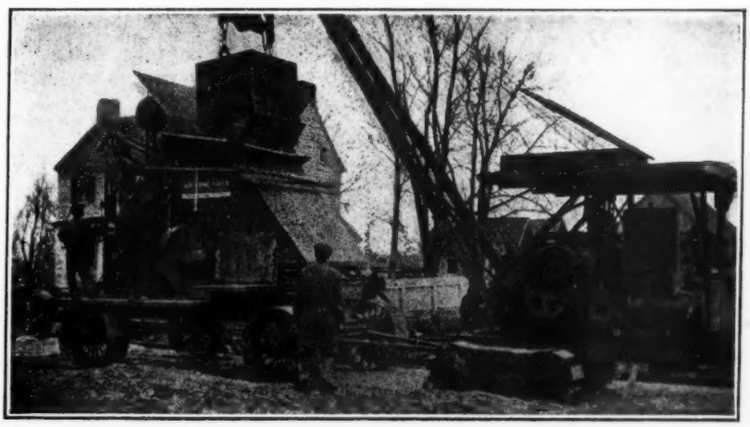
Rapid Road Concretirg

An unusually high rate of progress in concreting a 14-foot highway from 5 to 7 inches thick, west of Georgetown, Del., has been made by Elder & Company, executing contract CS-2 of the Delaware State Highway Department.

The work is of the standard type adopted by the Highway Department. The aggregate and cement, which are delivered in large wooden batch boxes, are unloaded and emptied into the charging hopper of an 8-bag Koehring mixer by a locomotive crane mounted on caterpillar traction which handles them with great rapidity so that little or no time is lost between batches. It is required that each batch shall be mixed at least 1½ minutes and as many as 30 batches have been mixed and placed in one hour.

Each batch lays a strip of pavement 5½ feet long and of the full width of the roadway. Although there has been great difficulty in maintaining a constant adequate supply of aggregate and cement and the machine has never been able to work long at full capacity on account of lack of material, it has attained an output of 781 linear feet in one 9-hour day. After three batches of concrete have been mixed and laid, the mixer is moved backwards 15 feet by the locomotive crane, which is kept attached to the machine and hauls the latter like a trailer.

The mixing machine is operated by a force of two men, one man operates the locomotive crane, and sixteen more men are required for setting, finishing and covering the concrete, trimming the sub-grades and setting the forms, making an average total of twenty men on the road, besides which there are about nineteen men in storage yards receiving and handling cement and aggregate.



8-BAG MIXING MACHINE LAYING 70 SQUARE FEET OF PAVEMENT EACH BATCH

NEWS OF THE SOCIETIES

Jan. 17-18—OHIO STATE ASSOCIATION OF BUILDERS' EXCHANGES. Ohio Hotel, Youngstown, O.

Jan. 18—WATER POWER LEAGUE OF AMERICA. First annual meeting. Engineering Societies' Building New York City.

Jan. 18-20—IOWA ENGINEERING SOCIETY. Annual meeting. Des Moines, Ia.

Jan. 19 — INTERNATIONAL CUT STONE CONTRACTORS' AND QUARRYMEN'S ASSOCIATION, Inc. Annual meeting. Congress Hotel, Chicago, Ill.

Jan. 19 — AMERICAN SOCIETY CIVIL ENGINEERS. New York City.

Jan. 19-20—MISSISSIPPI VALLEY ASSOCIATION and the NATIONAL DRAINAGE CONGRESS. Joint conference, Harrington Hotel, Washington, D. C.

Jan. 21—ENGINEER'S CLUB OF PHILADELPHIA. Bellevue-Stratford Hotel.

Jan. 25—NEW JERSEY STATE ASSOCIATION OF COUNTY ENGINEERS. Annual meeting. Engineers' Club, Trenton, N. J.

Jan. 25 — ATLANTA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Joint meeting with Atlanta Section, A.S.C.E. Carnegie Library.

Jan. 25 — PHILADELPHIA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Engineers Club of Philadelphia.

Jan. 25-27 — MICHIGAN ENGINEERING SOCIETY, STATE ASSEMBLY OF THE A.A.E., Detroit, Mich.

Jan. 25-27 — THE AMERICAN WOOD PRESERVERS ASSOCIATION. Place of meeting to be announced later.

Jan. 25, 26, 27—ASSOCIATED GENERAL CONTRACTORS. Annual meeting, New Orleans. Secretary's Office, Washington, D. C.

Jan. 27-28—INDIANA ENGINEERING SOCIETY. Annual meeting, Indianapolis. Secretary, Charles Brossman, Merchants Bank Building.

Jan. 28 — COLORADO SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Metropole Hotel.

Jan. 31-Feb. 5—NATIONAL BRICK MANUFACTURERS' ASSOCIATION AND COMMON BRICK MANUFACTURERS' ASSOCIATION OF AMERICA. Joint meeting. Hotel Pennsylvania, New York City.

Feb. 1-2—NEW YORK STATE ASSOCIATION OF BUILDERS. Convention. Rochester, N. Y.

Feb. 1, 2, 3—ONTARIO PROFESSIONAL MEETING in conjunction with the annual meeting of the Engineering Institute of Canada. Toronto.

Feb. 7-8—FLORIDA ENGINEERING SOCIETY. Annual meeting. Lakewood, Fla.

Feb. 9-12 — AMERICAN ROAD BUILDERS' ASSOCIATION. Eighteenth annual convention, eleventh American Good Roads Congress and twelfth National Good Roads Show, Coliseum, Chicago, Ill.

Feb. 11-12 — ENGINEERING SOCIETY OF WISCONSIN. Annual meeting, Madison. Secretary, Leonard S. Smith, Madison, Wis.

Feb. 14-16 — AMERICAN CONCRETE INSTITUTE. Annual meeting. Auditorium Hotel, Chicago, Ill. Secretary, Harvey Whipple, New Telegraph Building, Detroit, Mich.

Feb. 16-18 — AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Seventh midwinter convention. Engineering Societies' Building, New York City.

May 17-19—NATIONAL FIREMEN'S ASSOCIATION. Twenty-third annual convention. Fort Wayne, Ind.

June 7-9—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting. San Francisco, Cal.

June—CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS, State of N. Y. 12th Annual Conference. Elmira, N. Y.

June 6-10, 1921—AMERICAN WATER WORKS ASSOCIATION. Annual convention at Cleveland, Ohio. Secretary, J. M. Diven, 153 West 71st St., New York.

INDIANA ENGINEERING SOCIETY

Thursday, January 27, at the Claypool Hotel, Indianapolis, the Indiana Engineering Society will hold its forty-first annual meeting, including joint sessions with other local chapters of engineering societies.

At the first session, papers will be presented on "Specifications for Road Materials," by Fred Kellam, Indianapolis, and on "Freight Rates and Construction Work," by R. C. Yoeman, Indianapolis.

At 2 p. m., there will be a joint meeting of the Indiana Engineering Society, in which county surveyors and American Association of Engineers will participate. The program will includge discussion on "Engineers' License Law" and "County Surveyors' Bill." "The Economy of Early Contracts," by C. D. Franks, Indianapolis, and "Bonds As Applied to County Work."

At 7:45 p. m., there will be a joint meeting of the Indiana Engineering Society, American Society of Mechanical Engineers, American Society of Electrical Engineers, Indianapolis Scientific Club.

Papers will be presented on "Operating Characteristic of Small Steam Driven Pumps," by L. V. Ludy, LaFayette; "Some Problems in Supplying Electric Power Service to Rural Communities," by D. D. Ewing, LaFayette; "Lightning Protection for Rural Transmission Lines," by D. L. Curtner, LaFayette, and "The New 600,000 Volt Testing Laboratory at Purdue University," by C. Francis Harding, LaFayette.

On January 28, papers will be presented on "Preservation Treatment for Wood Poles," by R. V. Achatz, LaFayette; "Problems in Concrete Construction," by W. K. Hatt, LaFayette; "Residence Water Supplies," by G. C. Blalock, LaFayette, and on "The Brick Paved Highway," by Will P. Blair, Cleveland, Ohio, followed by routine business.

At 6:30 p. m., the annual dinner of the Indiana Engineering Societies will be held jointly with all other engineering organizations. Dean A. A. Potter, of Purdue University, and others will speak.

NEW ENGLAND WATER WORKS ASSOCIATION

The December meeting of the New England Water Works Association was held on December 8 at the Copley Square Hotel, Boston, Mass. The feature of the meeting was the reading of a paper on "The Water Supply of Geneva, Switzerland," which was illustrated with lantern slides. The paper was written by Monsieur A. Betant, engineer and director of water supply service for the city of Geneva, and translated from the French by Professor Whipple, who read the paper to the meeting and contributed an introductory description of the city of Geneva and its environs. The paper described the pumping system and water supply layout of the city, and was followed by pictures of the Geneva plant shown on the screen.

The subject of "Cleaning and Painting Standpipes" was opened by Charles W. Sherman. Among those taking part in the discussion which ensued were Reeves W. Newsom, Samuel E. Killam and Morrison Merrill, and a letter from Professor Harold K. Barrows, relative to this subject, was read by Secretary Frank J. Gifford. There was also some discussion of the best method of extinguishing fires in coal piles and the proper way of applying water in such cases, by S. H. Taylor, Chief Jesse Barrett, William F. Sullivan and John C. Chase; also a brief discussion of the subject of fires originating between the jackets of cotton fire hose during tests of pumping engines by Charles C. Sherman of Boston.

NEW JERSEY COUNTY ENGINEERS

The annual meeting of the New Jersey State Association of County Engineers will be held in Trenton on January 25 at the Engineers' Club, located over the Grand Theater on South Broad street, near the court house.

Papers will be presented on "Bridges for New Jersey Roads," by Charles A. Meade, bridge engineer, New Jersey Highway Department; "Some Facts Relating to Motor Vehicle Registration," by Wm. L. Dill, Commissioner of Motor Vehicles; and "Testing and Laboratory Control of Large Highway Contracts," by R. B. Gage, chemical engineer.

ENGINEERS' CLUB OF DES MOINES

The Engineers' Club and the Chamber of Commerce of Des Moines are making special provisions for the entertainment of the wives of visiting engineers at the Iowa Engineering Society's annual meeting. Engineers have been urged to bring their wives to this meeting.

Among other things the ladies' section of the program includes an afternoon tea at the Hoyt Sherman Place, a theater party, banquet and dance.

The society meets this year at the Chamberlain Hotel in Des Moines, January 18, 19 and 20.

ENGINEERS' CLUB OF SAN FRANCISCO

The Engineers' Club of San Francisco, at its regular noon-day meeting on December 1, was addressed by J. Waldo Smith, chief engineer, board of water supply, New York City, on New York's water supply problems.

WESTERN SOCIETY OF ENGINEERS

At the meeting of the Western Society of Engineers held on December 7 there were three addresses on "The Commercial Use of the Airplane." John F. Hayford discussed research problems; A. R. Rhenisch, recent progress and costs; and Walter Painter, commercial airplane types.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

ASPHALT BLOCK PRESS

An expensive feature of the asphalt paving industry is the inability to work at full time all the year around. Weather conditions as well as the inherent conditions associated with contract work interfere with the operation of the plant and at times necessitate a complete suspension of work. It has been estimated that no more than 150 to 200 full days' work is done in a year. During these periods of enforced idleness the plant overhead goes on just the same and the operators' profits are greatly reduced. If provided with an asphalt-block press, the plant could run at full blast the year around and this increased utility would represent practically clear profit.

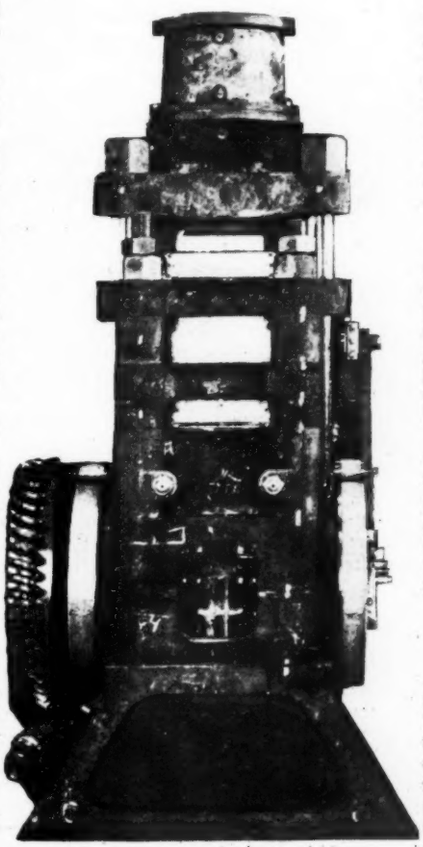
A press for manufacturing asphalt blocks is being put on the market by the National Moulding Press Corporation of 262 Fulton street, Brooklyn, N. Y., which, by virtue of its compactness, can be installed in a paving plant without altering any of the existing features. The press is constructed as a single unit which can be operated either by direct connection with an electric motor or by a belt connection with any existing jack shaft already installed in the plant. The press itself occupies a space of about 4 by 7 feet out-to-out and stands approximately 8 feet above the floor.

The aggregate and asphalt can be mixed by the same appliances used for asphalt paving mixture, except that there should be more careful screening and grading of the aggregate. The mixture is fed to the hopper of the block machine by a man or men on the upper floor of the plant, the correct rate of feeding being insured by an automatic indicator which guides the men in their feeding.

From the hopper the mixture drops by gravity into the mould, which is brought under the hopper to receive the charge, is filled and is then brought to a position between two vertical plungers, the motion of which is so synchronized that, when the mould is in position the lower one moves upward and the upper one downward, into the mould, compressing the block under a pressure that can be regulated as desired up to 400 tons. The plungers then separate, clearing the mould, the mould returns for a new charge, the lower plunger lifts the block to the level of a belt conveyor, the mould (which has meantime been refilled) moves forward and pushes the block onto the belt, at the same time going to position between the moving plungers to permit another block to be compressed.

The blocks are carried by the belt conveyor to and through a trough filled with water, which is flowing in a direction contrary to the motion of the blocks so as to be coldest where the blocks leave the trough. The blocks are then sufficiently cooled and solid to be carried away on wheelbarrows, by conveyor or other means, and stacked for shipment.

The pressure is transmitted by means of a system of toggle joints and an accumulator incorporated in the press. The press requires 25 to 30 horsepower for operating it. The capacity is approximately 1,000 standard asphalt blocks or tile per hour. The same machine can be used for making blocks of any of the three regular commercial thicknesses.



ASPHALT BLOCK PRESS

Advantages claimed for this machine are its compactness, economy of maintenance, absolute control of pressure exerted on the blocks, the feeding of the mixture to the mould, and the regulation of the uniformity of the blocks by means of an unique system of automatic safety devices incorporated in the press. The materials used in the construction are the best obtainable, the shaft for instance being made of special nickel steel and heavy bronze bearings being used throughout, while the frame of the structure is of cast steel.

EASTON INDUSTRIAL RAILWAYS

Bulletin 510 of the Easton Car and Construction Company is intended to promote the use of industrial railways and railway equipment for the handling of aggregate materials used in road building. Easton steel batch box buckets, generally furnished with separate compartments for the proper proportions of sand, stone and cement and having a watertight cover for the cement, can be supplied of wood or steel. Batch boxes having bottom dumping doors or trunnions for tilting are supplied also. These can be loaded at the plant by any convenient system of derricks, overhead bins or tunnels under stock piles, loaded on flat cars on industrial track in 16-foot sections mounted on corrugated steel ties with clips and bolt fastenings, curved sections and standard turnouts. Descriptive bulletins, plans and estimates and other information will be furnished on application to the Easton Car and Construction Company.

Bulletin 510 gives typical diagrams showing the arrangement of tracks and operation of cars for several ordinary conditions where the industrial track is laid on the shoulder of the road, or on sub-grade; where the concreting is commenced at the loading plant at one end of the road, or where the concreting is begun with a long haul from the loading plant.

One plan shows the arrangement of a surface stock pile and tunnel for aggregate and a gravity bin for bulk cement, the materials being unloaded by a locomotive crane operating on a track between the stock piles and the railroad, thus providing a large storage capacity at small expense.

CLEVELAND AIR TOOLS

Bulletin 44 of the Cleveland Pneumatic Tool Company describes and illustrates the new Cleveland pistol grip chipping hammer which does not require the air vent port that in other hammers allows a continuous wastage of air. The throttle valve graduates the air supply and reseats itself when worn. The hammers have high speed, steady operation and dustproof features.

There are twelve styles and sizes of chipping, caulking and beading hammers weighing from 4½ to 20 pounds each and striking 950 to 3,000 blows per minute.

Bulletin 47 describes various sizes and patterns of angle valves and manifolds for compressed air service. The Cleco valves are simple in construction, having only three parts—the body, plug, and handle. They require no packing and have no valve gate to renew or stems to bend or break. They are absolutely airtight under all pressures, and have an unrestricted air passage.

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INDUSTRIAL NOTES

The Oxweld Acetylene Co. has appointed the Standard Supply & Equipment Co. of New York and Philadelphia as eastern sales agent for Eveready welding and cutting apparatus and supplies, with George E. Temple as manager of its welding and cutting department.

The National Lime Association has appointed Laurence H. Hunt manager of the construction department and Major E. Holmes manager of the chemical department.

J. C. Kopf, formerly manager of the engineering department of the Duff Manufacturing Co., has been appointed research engineer and placed in charge of a newly established research department. F. W. Schwerin is now manager of engineering.

NEW ENGINEERING BUSINESS EXCHANGE OFFICE

The Engineering Business Exchange announces the opening of a Pacific Coast branch with James T. Whittlesey as director and with offices in the Claus Spreckels building, San Francisco.

ATLAS HAND BOOK

The Atlas Portland Cement Company has issued an attractive 4 x 7-inch, 144-page bound volume entitled: "Atlas Hand Book on Concrete Construction," at a price of $2, which is offered as a holiday gift, on request, to readers of the ever attractive and useful Contractors' Atlas. The purpose of the book is to provide in convenient form for the average builder practical information on plain and reinforced concrete.

It is written in a brief, clear and non-technical style to give valuable hints and suggestions, describe ordinary methods and standards and afford convenient aid in general concrete matters to the ordinary contractor.

It gives reliable data concerning the proper selection and proportioning of concrete materials, tests, and general instructions for concreting under water, in cold weather, and for finishing, mixing, placing concrete and making it watertight.

It contains chapters on reinforced concrete columns, beams, girders, towers, sidewalks and various common structures like garages, elevators, tanks, pavements, foundations, culverts, bridges, retaining walls and the like, with sketches and dimensioned details of forms and convenient appliances, together with various tables of sizes, strength, quantities, materials required for construction and other useful information and instructions for estimating quantities and costs, with sample estimate sheets for concrete construction work.

EASTERN PAVING BRICK MANUFACTURERS

The annual meeting of the Eastern Paving Brick Manufacturers' Association was held at the Waldorf-Astoria Hotel on December 14 and 15, 1920. Over twenty executives were in attendance. R. L. Wilson, of New York, president; R. T. Hutchins, of Wheeling, W. Va., treasurer; W. C. Perkins, of Philadelphia, secretary.

THE CEMENT GUN COMPANY, INC.

The Cement Gun Company announce the removal of its main office from Allentown to Cornwell, Pa., a suburb of Philadelphia.

TRAYLOR TRUCKS

Trucks and tractors manufactured by the Traylor Engineering & Manufacturing Company will be distributed by B. C. Collier from his office at Cornwell, Pa.

CHAS. T. TOPPING MACHINERY COMPANY

Chas. T. Topping, formerly of the Chas. T. Topping Machinery Co., Pittsburgh, dealers in contractors' equipment, who has been associated with the Lakewood Engineering Co., has engaged in the construction business for himself and has established his organization in the House building, Pittsburgh, and will act as district sales representative for the Austin Machinery Corporation, Chicago, manufacturers of concrete mixing, excavating, road building and material handling machinery and equipment.

The Willite Road Construction Co. is starting construction on three miles for the State Highway Department of Georgia on the Dixie Highway between Fitzgerald and Ocilla, Ga., Project S-11-7, A-3, unit 1,250 square yards. Cummer plant is now being erected at Ocilla. Mr. T. J. Carson is superintendent in charge for the Willite Company.

P. Flanigan & Sons, Baltimore, Md., have started work on two miles of the Bel Air Turnpike. A Willite surface will be used. This is the first Willite to be constructed by the Maryland State Road Commission.

About two miles of a seven-mile project for Muskegon county, Mich., have been completed by the Willite Road Construction Co. of Michigan. The work consists of a 3-inch Willite base and 2-inch Willite top.

Sales of Mack trucks in November increased 43 per cent over the month of October, announces the International Motor Company. The three months period just ended represents an 18 per cent increase over the same period in 1919.

PERSONALS

Sloan, Charles E., has been appointed city engineer of Manteca, Cal.

Schreiber, Fred H., formerly assistant state highway engineer of South Dakota, has been appointed state highway engineer to succeed F. S. Peck, who resigned.

Stromquist, W. G., formerly of the United States Public Health Service, is now sanitary engineer with the health department, Memphis, Tenn.

Tyrrell, George G., formerly with the Missouri State Highway Department, has been appointed resident engineer on the construction of Federal aid roads for the Mississippi State Highway Department.

Jacob, Thomas N., has been appointed chief engineer of the East Side Levee and Sanitary District, East St. Louis, Ill., with Elmer R. Rodenberg as resident engineer, and J. E. Weinel as field engineer.

Woodyard, Burdette, has resigned the position of highway engineer of Wood county, W. Va.

Batson, S. R., has resigned his position as highway engineer for Jefferson county, Ala.

Forman, Morris, has accepted a position as assistant drainage engineer, Winnebago county, Iowa.

Pomper, Alexander A., has been appointed assistant highway engineer, Monroe county, Mo.

Caton, John H., 3d, has been appointed division engineer in the Bureau of Public Works, La Vega, Dominican Republic, and is engaged in the construction of the new road across the republic.

Bracher, Gus A., has been appointed engineer of Washington county, Tex.

Harding, H. McL., consulting engineer of New York, has been retained by the city of New Haven, Conn., as consulting engineer on its port development.

Seymour, Horace Llewellyn, recently resigned as engineering assistant to Thomas Adams, the Dominion government's town planning adviser, in order to become affiliated with Frank Barber, consulting engineer, Toronto.

Brazier, H. A., city engineer of London, Ont., sailed for England on November 23 to investigate the activated sludge process for the treatment of sewage.

Danks, F. A., formerly assistant engineer of British Forgings, Ltd., Toronto, and later assistant editor of the *Canadian Engineer*, has been appointed secretary-treasurer of Automatic Telephone & Time Recorders, Ltd., of Toronto.

Lewis, Nelson P., chief engineer of the board of estimate and apportionments, New York City, retires this month from the municipal service, with which he has been connected for thirty-four years.

Allen, John R., heating and ventilating specialist, died at Pittsburgh on October 20. Mr. Allen has been connected with the college of engineering, University of Michigan, and later with the college of engineering and architecture, University of Minnesota; and at the time of his death was acting as consulting engineer on ventilation to the chief engineer of the New York and New Jersey commissions in charge of the construction of the Hudson river vehicular tunnels.

Waitt, Arthur M., consulting engineer and railroad specialist, died November 10, at Sharon, Conn. Mr. Waitt had been engaged in railroad work for 40 years, and at the time of his death was engaged in private practice as consulting engineer and railway specialist.

Wolfel, Paul L., chief engineer of the McClintic-Marshall Co., of Pittsburgh, one of the foremost bridge engineers of the day, died on December 28 at Philadelphia.

Wolfe, John W., division engineer, Board of Local Improvements, Chicago, died on December 12.